

# **NOTICE**

**All drawings located at the end of the document**

# INFORMATION ONLY

ROCKY FLATS ENVIRONMENTAL  
TECHNOLOGY SITE

Manual No  
Procedure No  
Page

21100-WP OU 01 5  
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1 of 1

WORK PLAN FOR THE START UP  
AND O&M OF THE IM/IRA  
FOR THE 881 HILLSIDE OU 1

Effective Date  
Organization

10/07/94  
Environmental Management

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### WORK PLAN FOR THE STARTUP OPERATION AND MAINTENANCE OF THE IM/IRA FOR THE 881 HILLSIDE OPERABLE UNIT NO 1

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ADMIN (RD)

A-OU01-0007 0

DOCUMENT CLASSIFICATION FOR EVALUATION  
R RB HQ AN CLASSIFICATION  
10 E 11 1 01

**INFORMATION  
ONLY**

**ROCKY FLATS PLANT  
OPERABLE UNIT 1  
GROUNDWATER TREATMENT FACILITY  
HEALTH AND SAFETY PLAN**

## HEALTH AND SAFETY PLAN

### Rocky Flats Plant Operable Unit 1 Groundwater Treatment Facility Health and Safety Plan prepared by Resource Technologies Group, Inc

The site-specific health and safety plan has been written for the use of Resource Technologies Group, Inc , their employees, and subcontractors All EG&G personnel associated with this Project shall comply with all aspects of this plan as related to health, safety and emergency response

### REVIEW AND APPROVAL

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**ROCKY FLATS PLANT  
OPERABLE UNIT 1 GROUNDWATER TREATMENT FACILITY  
HEALTH AND SAFETY PLAN**

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## **1 0 INTRODUCTION AND PURPOSE**

### **1 1 PURPOSE**

This plan establishes requirements and provides guidelines for worker safety and hazard identification during subcontractor operation of the Groundwater Collection and Treatment System for Operable Unit No 1 (OU1) located at the Rocky Flats Plant in Golden Colorado. The purpose of this plan is to identify procedures for avoiding potential hazards from chemicals, equipment, or the environment, and for responding to serious injury or accident. Revisions to this Plan will be made in accordance with the subcontractor Health and Safety Program and will be approved by EG&G.

## **2 0 SITE HISTORY, DESCRIPTION AND SCOPE OF WORK**

### **2 1 SITE HISTORY AND DESCRIPTION**

Operable Unit 1 is comprised of twelve sites in the 881 Hillside Area located at the southeast corner of the Rocky Flats Plant as shown in Figure 2 1. A brief description of each site in the 881 Hillside Area is presented below.

**Oil Sludge Pit (#102)** A small pond located south of Building 881 was used for disposal of oil sludges in the late 1950 s.

**Chemical Burial Site (#103)** A small pit was used for disposal of liquid wastes southeast of Building 881 in the early 1960 s.

**Liquid Dumping (#104)** An area east of Building 881 was reportedly used for disposal of unknown liquids prior to 1969. This was not substantiated by results of drilling the area in 1987. Therefore, this site may not exist and its location is not shown in Figure 2 1.

**No. 6 Fuel Oil Tanks (#105 1 and #105 2)** Two fuel oil tanks are located south of Building 881. They are out of service and filled with concrete.

**Outfall Site (#106)** An overflow line from the sanitary sewer sump south of Building 881 emerges on the slope below the building.

**Hillside Oil Leak (#107)** Oil was discovered flowing from the Building 881 footing drain in early 1973. The source of the oil was never positively identified but the oil was collected in a skimming pond and



transported off site There is an ongoing discharge of water from the footing drain

Multiple Solvent Spills (#119 1 and #119 2) Two areas east of Building 881 were used for barrel storage between 1969 and 1972

Radioactive Site (#130) Soils contaminated with low levels of radionuclides were placed on the hillside east of Building 881 and covered with soil between 1969 and 1972

Sanitary Sewer Line Leak (#145) The sanitary sewer line leaked on the hillside southwest of Building 881 in early 1981

Drum Storage Area (#177) Satellite collection and 90 day accumulation of RCRA regulated wastes at Building 885

Groundwater in the Building 881 Hillside area is contaminated with volatile organic compounds metals and radionuclides Chemical Hazard Sheets for the various contaminants present may be found in Section 5 0

## **2 2 SCOPE OF WORK**

As part of the Interim Measures/Interim Remedial Action (IM/IRA) Plan for Operable Unit Number 1 a groundwater handling and treatment facility was designed and constructed The facility consists of the following systems

*Groundwater Recovery and Storage System* Recovery well and collection well pumps groundwater on an as available basis to one of two 15 000 gallon groundwater equalization/storage tanks

*Process System* Collected waters flow through a UV/H<sub>2</sub>O<sub>2</sub> oxidation process to remove volatile organic constituents. The process water then flows to an ion exchange surge tank similar in size to the influent equalization tanks. Water is then pumped through the ion exchange system for removal of radionuclides, alkalinity, metals, and total dissolved solids.

The treatment plant may be operated up to 7 days per week, depending upon the amount of water requiring treatment. The subcontractor is responsible for operation and maintenance of the groundwater treatment facility. Figure 2.2 shows the location of the groundwater collection and treatment facility. Section 3.0 provides a more detailed description of the treatment system.

### **3 0 SYSTEM DESCRIPTION**

The groundwater collection and treatment system is illustrated in Figure 3 1 and consists of the following subsystems

- Groundwater collection and equalization
- Ultraviolet (UV)/Hydrogen Peroxide ( $H_2O_2$ ) Oxidation
- Ion Exchange
- Ion Exchange Regeneration and Regenerant Neutralization

Each of these process subsystems are discussed in detail below

#### **3 1 GROUNDWATER COLLECTION AND EQUALIZATION SYSTEM**

The groundwater collection system serves to divert and transfer design flows from recovery well pump P 100 and collection well pumps P 101 and P 102 to groundwater equalization/storage tanks T 201 and T 202 located on the south side of the treatment facility (Building 891) The raw water is pumped from the collection points to the equalization tanks through double-contained piping buried to prevent freezing The influent piping is equipped with leak detection equipment to monitor for leaks The equalization tanks have a capacity of 15 000 gallons each Groundwater influent levels in the tank are continuously monitored and displayed At design flow (30 GPM) the tanks can provide nearly 17 hours of equalization time

#### **3 2 ULTRAVIOLET (UV)/HYDROGEN PEROXIDE( $H_2O_2$ ) OXIDATION SYSTEM**

The UV/ $H_2O_2$  oxidation process is the first step in removing groundwater contaminants The purpose of this process is to oxidize the volatile organic constituents using 50 percent  $H_2O_2$  a strong oxidizer and UV light The UV light serves to catalyze the oxidation by

converting the peroxide to a hydroxyl radical thus making it a more effective oxidant. The UV/H<sub>2</sub>O<sub>2</sub> unit consists of two stainless steel reactor vessels each containing eight high intensity (high pressure) UV lamps. The lamps are installed inside quartz tubes to prevent direct contact of the water and the lamp. The reactors and control panel are mounted on a common skid.

Effluent from the UV/H<sub>2</sub>O<sub>2</sub> process flows to the ion exchange surge tank (T 203). The purpose of the surge tank is to receive process water and store it until it is pumped to the ion exchange system.

### **3.3 ION EXCHANGE SYSTEM**

From the surge tank, the water is pumped to two ion exchange columns (IX 1 and IX 2) in series. The first, IX 1, contains a strong base anion resin in the chloride form for the removal of radionuclides. The second column, IX 2, contains a weak acid cation resin in the hydrogen form for the removal of alkalinity and heavy metals. The groundwater flows from IX 2 to a degasifier where the liberated carbon dioxide escapes to the atmosphere. From the degasifier, the water is pumped to the final two ion exchange columns (IX 3 and IX-4) in series for removing total dissolved solids (TDS). IX 3 contains a strong acid cation resin that removes remaining positively charged cations including excess hardness and metals. IX-4, with weak base anion resin, is the last unit and removes excess negatively charged ions contributing to TDS. The treated groundwater then exits the building and flows to one of three 150,000 gallon final effluent storage tanks (T 205, T 206, and T 207) where it is held until analytical results indicate that it is acceptable for release to the south interceptor ditch.

### **3.4 ION EXCHANGE REGENERATION SYSTEM**

The ion exchange backwash and regeneration systems provide a means for maintaining the ion exchange resins while minimizing the volume of waste produced by the system.

The caustic tank (T 208) contains sodium hydroxide and is used for regenerating IX-4. IX 1 is not regenerated but is monitored for removal efficiencies for radionuclides. The acid tank (T 209) contains hydrochloric acid and is used to regenerate IX-3 after which it is used to regenerate IX 2. Spent regenerant chemicals from both processes are neutralized in the neutralization tank (T 210) prior to removal by tank truck for final treatment. In addition to regeneration the clean water storage tank (T 204) is used for storage of clean water for use in backflushing the ion exchange beds.



## **4 0 PROJECT TEAM ORGANIZATION AND RESPONSIBILITIES**

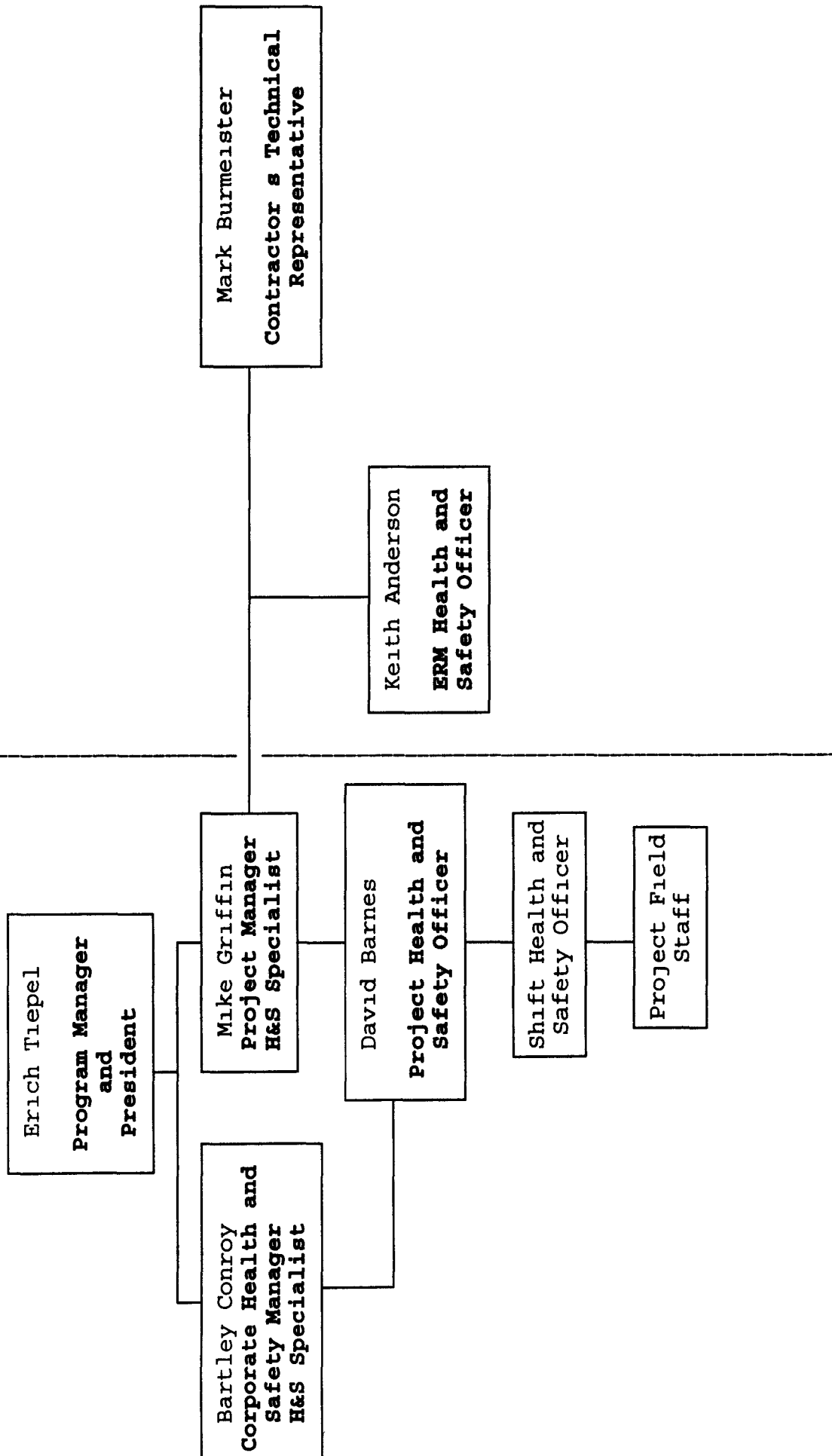
EG&G Rocky Flats has overall responsibility for the Health and Safety Program at the Rocky Flats Plant. The subcontractor is specifically responsible for the Health and Safety Plan for the operation and maintenance of the groundwater treatment facility at OU1. The project Health and Safety Organization is shown in Figure 4.1. Table 4.1 presents lead management and field personnel on the project. Major responsibilities for key personnel are summarized in Table 4.2.

FIGURE 1

HEALTH AND SAFETY ORGANIZATION

RESOURCE TECHNOLOGIES GROUP, INC.

EG&G ROCKY FLATS



**TABLE 4 1**  
**Project Personnel**

<u>COMPANY</u>	<u>FUNCTION</u>	<u>NAME</u>	<u>PHONE</u>
EG&G	Contractor s Technical Representative	Mark Burmeister	966 5891
EG&G	ERM Health and Safety Officer	Keith Anderson	966 6979
RTG	Program Manager	Erich Tiepel	969 8511
RTG	Corporate Health and Safety Officer	Bartley Conroy	969 8511
RTG	Project Manager Health and Safety Specialist	Michael Griffin	969 8511
RTG	Project Health and Safety Officer Health and Safety Specialist	David Barnes	966-4310

**TABLE 4 2****Personnel Responsibilities**

<b>Title</b>	<b>General Description</b>	<b>Responsibilities</b>
Project Manager	Has authority to direct response operations Assumes total control over site activities Stop work authority	<ul style="list-style-type: none"><li>o Prepares and organizes the background review of the situation Work Plan the Project Health and Safety Plan and the field team</li><li>o Ensures that the Work Plan is completed and on schedule</li><li>o Uses the Project Health and Safety Officer to ensure that safety and health requirements are met</li><li>o Prepares the final report and support files on the project activities</li></ul>
Project Health and Safety Officer	Advises the Project Manager on all aspects of health and safety on site Stops work if any operation threatens worker or public health or safety	<ul style="list-style-type: none"><li>o Periodically inspects protective clothing and equipment</li><li>o Ensures that protective clothing and equipment are properly stored and maintained</li><li>o Implements the health and safety plan</li><li>o Conducts periodic inspections to determine if the Project Health and Safety Plan is being followed</li><li>o Knows emergency procedures evacuation routes and the telephone numbers for emergency response</li></ul>

**TABLE 4 2 (Continued)**  
**Personnel Responsibilities**

Title	General Description	Responsibilities
Project Health and Safety Officer (continued)		o Sets up decontamination lines and the decontamination solutions appropriate for the type of chemical contamination on site
		o Controls the decontamination of all equipment personnel and samples from the contaminated areas
		o Assures proper disposal of contaminated clothing and materials
		o Ensures that all required equipment is available
		o Notifies EG&G emergency response personnel by telephone or radio in the event of a emergency
Subcontractor Health and Safety Officer		o Develops corporate Health and Safety Guidelines
		o Reviews Project Health & Safety Plans
		o Develops site specific Health & Safety procedures with Project Health & Safety Officer
		o Conducts inspections reviews compliance and review health & safety records

**TABLE 4 2 (Continued)**  
**Personnel Responsibilities**

Title	General Description	Responsibilities
Health and Safety Specialist	Provides support of operations involving monitoring of system processes and components for radiological contaminants	<ul style="list-style-type: none"> <li>o Performs routine monitoring of lab and PPE waste materials in accordance with EG&amp;G procedures to ensure control of radiological contaminants</li> <li>o Performs routine monitoring of sample shipment containers in accordance with EG&amp;G procedures to ensure control of radiological contaminants</li> <li>o Performs special monitoring for radiological contaminants as required in accordance with EG&amp;G procedures</li> </ul>
Plant Operator	Provides daily operation and maintenance of plant Stop work authority	<ul style="list-style-type: none"> <li>o Follows standard operating procedures Verifies that plant is operating in a safe manner &amp; complies with operations and environmental regulations</li> <li>o Maintains daily records of all activities</li> <li>o Conducts air monitoring as required</li> <li>o Advises project health and safety officer of any unusual events</li> </ul>

## **5 0 HEALTH AND SAFETY RISK ANALYSIS**

The hazards associated with the operation of the groundwater treatment facility at OU1 include hazardous substances (chemical and radiological) physical hazards heat and cold hazards and possible construction hazards

### **5 1 HAZARDOUS SUBSTANCES**

Potentially contaminated groundwater collected at the three collection points (P 100 P 101 and P 103) is expected to contain numerous hazardous substances This Section identifies and addresses potential chemical hazards

#### **5 1 1 Chemical Contaminant Hazards**

Table 5 1 presents influent concentrations of site contaminants taken from the Design Basis of the 881 Hillside Area Groundwater IM/IRA Treatment System Table 5 2 presents a summary of actual sampling results for the period of April through September 1992 showing concentrations of contaminants listed in the Design Basis which were present and the number of times each contaminant was identified It is apparent from a comparison of the data in Tables 5 1 and 5 2 that the Design Basis is a conservative estimate of potential contaminants in the OU1 influent stream All contaminants in Table 5 2 are not present or are well below the Design Basis concentrations

Table 5 3 presents a summary of the chemical hazards routes of exposure and first aid for each contaminant listed in Tables 5 1 and 5 2

TABLE 5 1

**Basis for Design of Groundwater IM/IRA Treatment System**

Constituent	Unit	Influent Concentration <sup>a</sup>
<b><u>Organics</u></b>		
Methylene Chloride	$\mu\text{g/l}$	<5 <sup>b</sup>
Acetone	$\mu\text{g/l}$	<10 <sup>b</sup>
Carbon Disulfide	$\mu\text{g/l}$	<5 <sup>b</sup>
1 1 Dichloroethene	$\mu\text{g/l}$	622
1 1 Dichloroethane	$\mu\text{g/l}$	11
1 2 Dichloroethane	$\mu\text{g/l}$	2 0
1 1 1 Trichloroethane	$\mu\text{g/l}$	945
Carbon Tetrachloride	$\mu\text{g/l}$	65
Trichloroethene	$\mu\text{g/l}$	845
1 1 2 Trichloroethane	$\mu\text{g/l}$	<5 <sup>b</sup>
Tetrachloroethene	$\mu\text{g/l}$	311
Toluene	$\mu\text{g/l}$	<5 <sup>b</sup>
<b><u>Metals</u></b>		
Aluminum	mg/l	0 0703
Antimony	mg/l	0 0264
Arsenic	mg/l	0 0049
Barium	mg/l	0 1076
Beryllium	mg/l	0 0022
Cadmium	mg/l	0 0021
Cesium	mg/l	0 1515



**TABLE 5 1 (Continued)****Basis for Design of Groundwater IM/IRA Treatment System**

<b>Constituent</b>	<b>Unit</b>	<b>Influent Concentration</b>
<b><u>Metals (Con't)</u></b>		
Chromium	mg/l	0 0071
Copper	mg/l	0 0355
Iron	mg/l	0 0410
Lead	mg/l	0 0026
Lithium	mg/l	0 0450
Manganese	mg/l	0 0738
Mercury	mg/l	0 1290
Molybdenum	mg/l	0 0085
Nickel	mg/l	0 0683
Selenium	mg/l	0 1743
Silver	mg/l	0 0145
Strontium	mg/l	0 8287
Thallium	mg/l	0 0072
Vanadium	mg/l	0 0391
Zinc	mg/l	0 1883

<sup>a</sup> Based on a flow weighted average of the 881 Building footing drain (5 gpm) and alluvial groundwater at the 881 Hillside that would be collected in the french drain (2 gpm) Averages computed from the 1987 and 1988 data base except organics Organic concentrations determined from first and second quarter 1989 data

<sup>b</sup> Detectable concentrations in some wells however blend should have non detectable concentrations

**TABLE 5 2****Summary of Organic and Inorganic Contaminants Detected in OU1 Influent****April Through September, 1992**

<b><u>ANALYTE</u></b>	<b><u>NUMBER OF DETECTS</u></b>	<b><u>MEAN CONCENTRATION</u></b>	<b><u>STANDARD DEVIATION</u></b>	<b><u>NUMBER OF NONDETECTS</u></b>
<b>Organics, µg/L</b>				
Tetrachloroethene	13	18 84	8 41	0
Acetone	1	27 0	0	12
1 1 Dichloroethene	1	17 0	0	12
1 1 1 Trichloroethane	1	18 0	0	12
Trichloroethene	7	39 66	75 06	6
Toluene	1	20 0	0	12
<b>Inorganics mg/L</b>				
Aluminum	4	0 18	0 19	3
Arsenic	4	0 003	0 0005	3
Barium	7	0 25	0 27	0
Chromium	3	0 03	0 03	4
Copper	5	0 01	0 01	2
Iron	7	0 21	0 26	0
Lead	2	0 01	0 0003	5
Lithium	6	0 01	0 01	0
Manganese	3	0 01	0 01	4
Molybdenum	2	0 04	0 05	5
Selenium	7	0 04	0 08	0
Vanadium	2	0 02	0 02	5
Zinc	7	0 047	0 01	0

Note U = Below detection limits

TABLE 5 3

## Chemical Hazards Posed by Site Contaminants and Route of Exposure

Contaminant (Synonyms) (Abbreviations)	Design Basis Concentration $\mu\text{g/l}$	PEL (OSHA) or TLV (ACGIH) or REL	IDLH	Physical/ Chemical Characteristics	Routes of Exposure	First Aid	Exposure Symptoms	IP eV
Methylene Chloride (Dichloro methane Methylene Dichloride)	<5	500 ppm	Carcinogen (5 000 ppm)	Colorless liquid with chloroform like odor BP 104 F UEL 22 / LEL 14 /	Inhalation Ingestion Contact	Artificial respiration Seek medical attention Irrigate and wash affected area immediately	Fatigue weakness sleepiness lightheaded ness numb ness and tingling in limbs nausea eye and skin irritation	11 32
Acetone	<10	750 ppm	20 000 ppm	Colorless liquid with a fragrant mint like odor Fl pt 14 F LEL 2.6 % UEL 12.8 % VP 266 mm Hg (@ 77 F)	Inhalation Ingestion Contact	Artificial respiration Seek medical attention Irrigate and wash affected area immediately	Eye nose and throat irritation headache dizziness dermatitis	9 69
Carbon Disulfide (Carbon Bisulfide)	<5	4 ppm	500 ppm	Colorless to faint yellow liquid UEL 50 % LEL 1.3 %	Inhalation Ingestion Absorption Contact	Artificial respiration Seek medical attention Irrigate and wash affected area immediately	Dizziness headache fatigue poor sleep nervousness psychosis coronary heart disease gastritis eye skin burns	10 08
1,1 Dichloro ethylene (Vinylidene chloride) (1,1 Dichloro oethene) (1,1 DCE)	622	1 ppm	Carcinogen	Colorless Liquid mild sweet odor LEL 7.3 / UEL 16 %	Inhalation Ingestion Contact	Artificial respiration Seek medical attention Irrigate and wash affected area immediately	Liver and kidney changes	9 65
1,1 Dichloro ethane	11	100 ppm	4 000 ppm	Colorless oily liquid Chloroform like odor	Inhalation Ingestion Contact	Artificial respiration Seek medical attention Irrigate and wash affected area immediately	CNS depression liver and kidney damage skin irritation	11 06

**TABLE 5 3 (Continued)**

**Chemical Hazards Posed by Site Contaminants and Route of Exposure**

<b>Contaminant (Synonyms) (Abbreviations)</b>	<b>Design Basis Concentration µg/l</b>	<b>PEL (OSHA) or TLV (ACGIH) or REL</b>	<b>IDLH</b>	<b>Physical/ Chemical Characteristics</b>	<b>Routes of Exposure</b>	<b>First Aid</b>	<b>Exposure Symptoms</b>	<b>IP eV</b>
1 2 Dichloro ethene (1 2 Dichloro ethylene)	2	200 ppm	4 000 ppm	Colorless liquid with slightly acid chloroform like odor UEL 12.8% LEL 5.6%	Inhalation Ingestion Contact	Artificial respiration Seek medical attention Irrigate and wash affected area immediately	Eye irritation CNS depression Respiratory system	9 65
1 1 1 Trichloro ethane (Methyl Chloroform) (1 1 1 TCA)	945	350 ppm	1 000 ppm	Colorless liquid mild sweet odor LEL 7.5% UEL 12.5%	Inhalation Ingestion Contact	Artificial respiration Seek medical attention Irrigate and wash affected area immediately	Eye and skin irritation dermatitis headache drowsiness	11 00
Carbon Tetrachloride (Tetrachloro methane)	65	2 ppm	Carcinogen (300 ppm)	Colorless liquid sweet odor not combustible VP 91 mm Hg	Inhalation Ingestion Absorption Contact	Artificial respiration Seek medical attention Irrigate and wash affected area immediately	CNS depression nausea and vomiting liver and kidney damage skin irritation	11 47
Trichloro ethylene (Ethylene Trichloride) (TCE) (Trichloro ethene)	845	50 ppm	Carcinogen (1 000 ppm)	Colorless liquid sweet odor LEL 8% UEL 10.5%	Inhalation Ingestion Contact	Artificial respiration Seek medical attention Irrigate and wash affected area immediately	Headache vertigo visual disturbance vomiting nausea eye and skin irritation	9 45
1 1 2 Tri chloroethane	<5	10 ppm	Carcinogen (500 ppm)	Chloroform like odor Non combustible	Inhalation Ingestion Absorption Contact	Artificial respiration Seek medical attention Irrigate and wash affected area immediately	Carcinogen Irritate eyes nose throat cramps vomiting diarrhea affects sleep and appetite	11 00
Tetrachloro ethylene (Perchloro ethylene) (Tetrachloro ethene) (Perchlor)	311	25 ppm	Carcinogen (500 ppm)	Colorless liquid with sweet odor Not combustible VP 14 mm Hg	Inhalation Ingestion Contact	Artificial respiration Seek medical attention Irrigate and wash affected area immediately	Eye Nose throat irritation nausea flush face vertigo headache liver kidney CNS	9 32

**TABLE 5 3 (Continued)**

**Chemical Hazards Posed by Site Contaminants and Route of Exposure**

Contaminant (Synonyms) (Abbreviations)	Design Basis Concentration $\mu\text{g/l}$	PEL (OSHA) or TLV (ACGIH) or REL	IDLH	Physical/ Chemical Characteristics	Routes of Exposure	First Aid	Exposure Symptoms	IP eV
Toluene (Methyl Benzene) (Methyl Benzol)	<5	100 ppm	2 000 ppm	Colorless liquid with a sweet pungent odor UEL 7 1 % LEL 1 2 %	Inhalation Ingestion Absorption Contact	Artificial respiration Seek medical attention Irrigate and wash affected area immediately	Fatigue weakness confusion dizziness headache dilated pupils nervousness insomnia	8 82
Aluminum	0 0703 mg/l	15 mg/m (Total) 5 mg/m <sup>3</sup> Respirable)	NA	Silvery ductile metal	Inhalation	NA	Pulmonary fibrosis possibly Alzheimer	N/A
Antimony	0 0264 mg/l	0 5 mg/m <sup>3</sup>	80 mg/m <sup>3</sup>	Silvery white metal	Inhalation Contact	Artificial respiration Seek medical attention Irrigate and wash affected area	Irritates eyes nose throat cramps vomiting diarrhea affects sleep and appetite	N/A
Arsenic	0 0049 mg/l	0 010 mg/m <sup>3</sup>	Carcinogen (100 mg/m )	Silver-gray or tin white brittle solid	Inhalation Absorption Contact Ingestion	Irrigate and wash affected area immediate medical attention	Nasal ulceration GI disturbances respiratory irritation	N/A
Barium	0 1076 mg/l	0 5 mg/m	1 100 mg/m	Silver-white slightly lustrous	Inhalation Ingestion Contact	Artificial respiration Seek medical attention Irrigate and wash affected area immediately	Irritates eyes nose throat upper respiratory GI muscle spasm slow pulse skin burns	N/A
Beryllium	0 002 2 mg/l	0 002 mg/m <sup>3</sup>	Carcinogen (10 mg/m <sup>3</sup> )	Metal a brittle grey white solid noncombustible slight explosion hazard in dust or powder form	Inhalation	For eye exposure irrigate eyes immediately	Respiratory symptoms fatigue weakness weight loss	N/A

**TABLE 5 3 (Continued)**

**Chemical Hazards Posed by Site Contaminants and Route of Exposure**

<b>Contaminant (Synonyms) (Abbreviations)</b>	<b>Design Basis Concentration mg/l</b>	<b>PEL (OSHA) or TLV (ACGIH) or REL</b>	<b>IDLH</b>	<b>Physical/ Chemical Characteristics</b>	<b>Routes of Exposure</b>	<b>First Aid</b>	<b>Exposure Symptoms</b>	<b>IP eV</b>
Cadmium	0 0021	0 2 mg/m	Carcinogen (50 mg/m )	Silver white blue tinged solid	Inhalation Ingestion	Artificial respiration Seek medical attention	Pulmonary edema cough tight chest chills muscle aches nausea vomiting diarrhea	N/A
Cesium	0 1515	NA	No Evidence	Silver white ductile metal or silvery liquid	Inhalation Ingestion	Artificial respiration Seek medical attention	Hypenrmt ability spasms	N/A
Chromium	0 0071	1 mg/m	No Evidence	Blue-white to steel-gray lustrous solid	Inhalation Ingestion	Artificial respiration Seek medical attention Irrigate and wash affected area immediately	Corrosive to skin and mucous membranes carcinogen of the lungs nasal cavity stomach larynx	N/A
Copper	0 0355	1 mg/m <sup>3</sup>	No Evidence	Reddish lustrous malleable solid	Inhalation Ingestion Contact	Artificial respiration Seek medical attention Irrigate and wash affected area immediately	Irritation of eyes and mucous membranes pharynx poison by ingestion metal taste damage of nervous system kidneys and liver	N/A
Iron	0 0410	10 mg/m	No Evidence	Silvery white tenacious lustrous ductile metal	Inhalation Ingestion	Artificial respiration Seek medical attention	Poison by intrapari- toneal route tissue and lung irritant and carcinogen	N/A
Lead	0 0026	0 050 mg/m <sup>3</sup>	700 mg/m	Bluish-gray soft metal	Inhalation Ingestion Contact	Artificial respiration Seek medical attention Irrigate and wash affected area immediately	Carcinogen of lungs and kidneys affects CNS GI tract blood	N/A

TABLE 5 3 (Continued)

## Chemical Hazards Posed by Site Contaminants and Route of Exposure

Contaminant (Synonyms) (Abbreviations)	Design Basis Concentration mg/l	PEL (OSHA) or TLV (ACGIH) or REL	IDLH	Physical/ Chemical Characteristics	Routes of Exposure	First Aid	Exposure Symptoms	IP eV
Lithium	0 0450	NA	NA	Silver colored light metal	Inhalation Ingestion	Artificial respiration Seek medical attention Irrigate and wash affected area immediately	Reacts with body moisture to cause burns toxic to CNS	N/A
Manganese	0 0738	5 mg/m	No Evidence	Silvery or reddish gray solid brittle combustible	Inhalation Ingestion	Artificial respiration seek medical attention	Parkinson's CNS and lung damage sleepiness vomit weakness tremors	N/A
Mercury	0 1290	0 01 mg/m <sup>3</sup>	10 mg/m	Silvery mobile odorless liquid	Inhalation Ingestion Contact Absorption	Artificial respiration Seek medical attention Irrigate and wash affected area immediately	Eye and skin irritant poison by inhalation cough tremor headache irritability GI and CNS affected	N/A
Molybdenum	0 0085	10 mg/m (Insoluble)	No Evidence	Dark gray or black powder with a metallic luster	Inhalation Ingestion	Artificial respiration Seek medical attention immediately	Irritates eyes nose and throat diarrhea list lessness liver kidney damage	N/A
Nickel	0 0683	1 mg/m <sup>3</sup> (Insoluble) 0 1 mg/m (Soluble)	Carcinogen (No Evidence)	Silvery white hard malleable and ductile metal	Inhalation Ingestion Contact	Artificial respiration Seek medical attention Irrigate and wash affected area immediately	Nasal lung and skin irritant carcinogenic	N/A
Selenium	0 1743	0 2 mg/m	Unknown	Steel gray nonmetallic element combustible	Inhalation Absorption Ingestion Contact	Artificial respiration Seek medical attention Irrigate and wash affected area immediately	Irritated eyes nose throat GI distress chills headache	N/A

TABLE 5 3 (Continued)

## Chemical Hazards Posed by Site Contaminants and Route of Exposure

ACGIH	American Conference of Governmental Industrial Hygienists
C	Ceiling-Concentration shall not be exceeded at any time
CNS	Central Nervous System
Fl pt	Flash point-closed cup unless otherwise noted
IDLH	Immediately Dangerous to Life and Health Maximum concentration from which one could escape within 30 minutes without experiencing any irreversible health effects
IP	Ionization potential (eV)
LEL	Lower Explosive Limit
mg/m	milligrams per cubic meter
N/A	Not applicable
NA	Not available
OSHA	Occupational Safety and Health Administration
PEL	Permissible Exposure Limit-Concentration that nearly all workers may be repeatedly exposed day after day without adverse effect (Based on an 8 hour workday and 40-hour workweek)
PPM	Parts Per Million
TLV	Threshold Limit Value-Concentration that nearly all workers may be repeatedly exposed day after day without adverse effect (Based on an 8 hour workday and 40-hour workweek)
UEL	Upper Explosive Limit
µg/m	micrograms per cubic meter
VP	Vapor Pressure at 68 F in millimeters (mm) mercury (Hg) unless otherwise noted

### References

Air Contaminants Permissible Exposure Limits (29 CFR 1910 1000)

American Conference of Governmental Industrial Hygienists Threshold Limit Values and Biological Exposure Indices for 1990 to 1991

National Institute of Occupational Safety and Health Pocket Guide to Chemical Hazards June 1990

N Irving Dangerous Properties of Industrial Materials Van Nostrand Reinhold Company New York 1979

**TABLE 5 3 (Continued)**



## 5 1 2 Process Chemical Hazards

In addition to the hazards posed by contaminants contained in the influent waste stream chemicals used in the treatment process pose a hazard to personnel Table 5 4 presents a summary of the chemical hazards routes of exposure and first aid for each process chemical used in the groundwater treatment Material Safety Data sheets are contained in Appendix A

**TABLE 5 4**

### Chemical Hazards Posed by Process Chemicals and Routes of Exposure

CHEMICAL EXPOSURE (Synonyms)	CONCEN TRATION	TLV/PEL	IDLH	PHYSICAL/ CHEMICAL CHARACTERISTICS	ROUTES OF EXPOSURE	FIRST AID	SYMPTOMS
Hydrochloric Acid	35 /	5 ppm (7 mg/m <sup>3</sup> )	100 ppm	Colorless liquid	Inhalation Ingestion Contact	Artificial respiration Seek medical attention Irrigate and wash affected area immediately	Nose and throat irritation burns throat and eyes cough choking
Sodium Hydroxide (Caustic Soda) (Lye)	50 % Solution	2 mg/m <sup>3</sup>	250 mg/m	White odorless solid before mixing disagreeable sweet odor in solution	Inhalation Ingestion Contact	Artificial respiration Seek medical attention Irrigate and wash affected area immediately	Severe skin irritation nose irritation temporary loss of hair
Liquid Nitrogen	100 /	None	None	BP 320 4 F	Inhalation Contact	Artificial respiration Wash skin off with tepid water	Asphyxiant at high concentrations Freezes tissue narcotic at high concentrations and pressure
Hydrogen Peroxide	50 /	1 ppm	75 ppm	Colorless liquid with a slightly sharp odor Noncombustible	Inhalation Ingestion Contact	Artificial respiration Seek medical attention Irrigate and wash affected area immediately	Eye nose and throat irritation corneal ulcer

**TABLE 5 4 (Continued)**

**Chemical Hazards Posed by Process Chemicals and Routes of Exposure**

CHEMICAL EXPOSURE (Synonyms)	CONCEN TRATION	PHYSICAL/		CHEMICAL CHARACTERISTICS	ROUTES OF EXPOSURE	FIRST AID	SYMPTOMS
		TLV/PEL	IDLH				
Nitrogen Compressed Gas	100 /	Simple Asphyxiant	Simple Asphyxiant	Colorless odorless gas	Inhalation	Move to fresh air Artificial respiration if required	ACUTE Rapid respiration muscular incoordination fatigue nausea vomiting and loss of consciousness
Hydrogen Compressed Gas	100%	Simple Asphyxiant	Simple Asphyxiant	Odorless colorless tasteless gas	Inhalation	Move to fresh air Artificial respiration if required	ACUTE Rapid respiration muscular incoordination fatigue nausea vomiting and loss of consciousness
Helium Compressed Gas	>99 /	Simple Asphyxiant	Simple Asphyxiant	Colorless odorless tasteless inert gas	Inhalation	Move to fresh air Artificial respiration if required	ACUTE Rapid respiration muscular incoordination fatigue nausea vomiting and loss of consciousness
Compressed Air	100 /	None	None	Colorless gas	Inhalation	Inhalation at greater than atmospheric pressure without complete decompression may cause decompression sickness	Symptoms of decompression sickness include headache vertigo fatigue vomiting

## 5 2 RADIOLOGICAL HAZARDS

The radiological hazards associated with operation of the groundwater treatment facility arise from alpha beta and gamma radiations which are emitted from the present radionuclides during decay Table 5 5 lists radionuclides and design basis concentrations Alpha beta and gamma radiations are all forms of ionizing radiation The chronic health hazards associated with exposure to ionizing radiation may include an increased risk of cancer and genetic effects Various acute health effects are associated with high radiation exposures An acute health effect is defined as an observable physiological change appearing within days to several weeks after exposure However radiation levels associated with operation of the groundwater treatment facility are well below those necessary to produce acute health effects The actual radionuclide concentrations experienced in the plant influent water are well below these design basis values

TABLE 5 5

### RADIOLOGICAL CONTAMINANT DESIGN BASIS FOR IM/IRA TREATMENT SYSTEM

Constituent	Units	Influent Concentration <sup>a</sup>
<u>Total Radionuclides</u>		
Gross Alpha	pCi/l	21 5
Gross Beta	pCi/l	17 8
Total Uranium	pCi/l	15 4
Strontium (89 90)	pCi/l	<1 0
Plutonium (239 240)	pCi/l	<0 01
Americium (241)	pCi/l	<0 01
Tritium	pCi/l	<400

#### NOTES

Based upon a flow weighted average of the 881 Building footing drain flow (5 gpm) and alluvial groundwater at the 881 Hillside that would be collected in the french drain (2 gpm) Averages computed from the 1987 and 1988 data base  
Detectable concentrations in some wells Blend should have no detectable concentration

Groundwater treatment facility operators could be exposed to low levels of alpha beta and gamma radiation through exposure external beta/gamma radiation radioactive air particulates and radioactive contamination The greatest potential for any health effects from radiation are at processes or material locations in which the contaminants contained in the water are concentrated (e g filters ion exchange resins) Monitoring methods worker exposure limits and administrative action levels for these radiation exposure aspects are separately addressed in this plan

### **5 2 1 External Radiation Exposure**

Both beta and gamma radiations are emitted by the radionuclides present in the groundwater treatment facility waste stream External beta radiation cannot penetrate beyond the shallow layers of the skin or the lens of the eye and so associated hazards are confined to these areas However eye exposure to external beta radiation is greatly reduced or eliminated through the use of coveralls and eye protection

External gamma radiation unlike beta radiation readily penetrates deep into the body and is therefore hazardous to internal organs Clothing and eye protection are not effective at reducing external gamma radiation exposure Three accepted methods to minimize gamma exposures are

- the use of shielding between personnel and the radiation source
- minimizing time in the radiation area and
- maximizing distance from the radiation source

Due to low levels of gamma radiation external shielding designed to reduce gamma radiation exposure should not be necessary for workers at the groundwater treatment facility Should external radiation be of concern the most effective methods of reducing worker exposure to external gamma radiation will be by posting areas where elevated

gamma exposure rates exist limiting the amount of time workers spend in these areas and maintaining a maximum distance from radiation sources

## **5 2 2 Internal Radiation Exposure**

Alpha radiation is present in the groundwater treatment facility waste stream Alpha radiation due to its relatively large mass and charge does not pose an external hazard and will not penetrate the layer of dead skin cells However alpha radiation is a significant internal hazard due to the large amount of energy deposited in small localized areas of internal organs Alpha radiation is principally admitted to the body by inhalation of airborne contamination or ingestion injection or absorption of surface contamination

Radioactive contamination existing in the form of loose material is capable of migrating or being transported by a variety of mechanisms such as movement of personnel vehicles equipment and wind Several hazards are posed to workers concerning loose contamination These hazards are inhalation ingestion injection and absorption of contamination

Air particulates that are suspended or have settled out on horizontal surfaces (equipment) and have been resuspended pose an inhalation hazard Drinking contaminated water eating contaminated food and/or transferring contamination to the mouth pose an ingestion hazard Abrasions lacerations or punctures of the skin resulting from contact with contaminated surfaces pose an absorption hazard

Exposure to radioactive contamination and the potential for internal contamination can be controlled by the proper use and removal of PPE administrative controls in controlled areas including prohibitions against smoking eating drinking and chewing and proper use of respirators when airborne contamination above prescribed limits is possible or suspected

### 5 3 OPERATIONAL SAFETY HAZARDS

The primary operational safety hazards and associated with this work and the control measures which will be implemented include the following

- Injuries from moving and/or energized or pressurized parts and machinery engineering controls include the installation of guards to prevent contact with moving machinery administrative controls include the use of lock out/tag out procedures to prevent injury from energized and/or pressurized systems
- Injuries from defective tools or mishandling of tools, materials, or equipment controls will include inspection of all tools prior to use for defects or damage and thorough training of operational personnel in the proper handling and use of the materials and equipment in use at the treatment facility proper equipment use will be controlled through the use of approved Standard Operating Procedures
- Injuries from falls during work performed at above ground locations or from being struck by falling objects controls will include training and use of the proper fall protection equipment and use of hard hats where overhead hazards are present
- Injuries from slips, trips, and falls from working on wet surfaces or in inadequately illuminated work areas controls will include proper housekeeping and control of liquid and snow and ice on walking surfaces and the use of slip resistant surfaces adequate lighting will be provided and maintained in all work areas requiring access during darkness

- Injury during work in confined spaces All entries into designated confined spaces will be performed in accordance with current EG&G confined space policies and procedures by properly trained personnel
- Injuries from failure to wear proper personal protective equipment Section 8.0 of this Health and Safety Plan contains requirements for selection and use of personal protective equipment during all tasks associated with operation and maintenance of the treatment facility. Operational personnel receive training in the use of personal protective equipment and are required to read and acknowledge understanding of the contents of this plan. Additionally, Daily Safety Briefings are conducted at the beginning of each shift to discuss planned activities and control measures required, including the proper personal protective clothing.

#### **5.4 ENVIRONMENTAL AND BIOLOGICAL HAZARDS**

In addition to the hazards described above, during the operation and maintenance of the groundwater treatment facility, there is the potential for worker exposure to high winds, serious temperature extremes, biological hazards, UV light, and noise. High winds pose a hazard to workers in areas outside the groundwater treatment facility building (Building #891). Outside work will be curtailed due to sustained winds following EG&G Plant announcements. Potentially serious temperature extremes could produce heat-related illnesses such as heat stroke, heat exhaustion, and heat cramps for workers outside Building 891. During extreme cold weather, the primary hazards of concern for workers outside will be hypothermia and frostbite.

The main biological hazards of concern, primarily outside Building 891, will be insect and snake bites. Additionally, equipment and machinery may generate levels of noise that could contribute to chronic hearing loss. UV light from the

UV/H<sub>2</sub>O<sub>2</sub> system could cause UV radiation damage to the eyes and skin if the shields are removed from the viewing ports



## **6 0 GENERAL SITE REQUIREMENTS**

Given the diverse nature and potential effects of the expected contaminants at the OU1 groundwater treatment facility careful safety precautions are necessary to ensure maximum protection of human health and the environment This section presents general requirements which apply to all activities on the site The purpose of these requirements is to ensure that operators and other subcontractor personnel involved with the operation of OU1 are properly prepared for the activities they will be performing

### **6 1 EMPLOYEE TRAINING**

All operators and associated personnel working on this project shall be trained in accordance with the requirements of 29 CFR 1910.120 A training file for each subcontractor site employee will be maintained on site This training file will include certificates and training records required by the subcontractor as well as site specific forms generated by EG&G A training file containing the subcontractor records will also be maintained at the corporate office

#### **6 1 1 40 Hour Hazardous Waste Site Training**

This training shall be a 40 hour hazardous waste course including the following elements

- Hazard identification

- Applicable regulations

- Permissible exposure limits

- Hazard communication (MSDS reference sources)

- Physical & chemical effects of hazardous materials

Air monitoring and

Respiratory protection including fit testing

### **6 1 2 24 Hour On The-Job Training**

In addition to 40 hour Hazardous Waste Site Training a site specific OSHA 24 hour on the job training shall be given to all workers and properly documented This shall consist of a review of site contaminants and hazards the contents of this plan and the actions to be taken in the event of emergencies Employees shall also be trained on the use of MSDS sheets which will be available to all personnel for chemicals used in the groundwater treatment facility

### **6 1 3 Respiratory Protection Training**

Respiratory Protection training is integral to the subcontractor Respiratory Protection Program Field personnel will complete the level of respiratory protection training that is appropriate to their job description during initial 40 hour OSHA training and annually thereafter Topics that will be covered for the subcontractor operations personnel at the groundwater treatment facility will include the following

- Overview of respiratory protection

- Physiology of the respiratory system

- Classification of respiratory hazards

- Air purifying respirators

- Respirator selection use and limitations

- Fit testing maintenance and cleaning

- Air supplying respirators/SCBAs/airline respirators

- SCBA/airline respirators field exercise and

- Examination

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#### **6 1 4 Supplemental Training**

Supplemental training shall include the following

- 8 hour supervisor training (shift foremen Health and Safety Officer)
- Current 8 hour refresher training (all employees)
- Respiratory protection training (all employees) and
- First aid and CPR training (at least one employee per shift)
- Confined Space Entry Training (as determined by EG&G Project Manager)
- Pressure Safety Awareness and Intermediate Pressure Safety (as determined by the EG&G Project Manager)

The Project Manager shall be responsible for verifying the current status of training for all employees assigned to the project. Any deficiencies shall be cleared prior to the employee beginning work on the field portion of the project.

Finally, all employees must read and acknowledge in writing that they have read this site specific Health and Safety Plan. A sample acknowledgement is shown on Figure 6 1. Blank acknowledgement forms must be kept in the operations office at OU1 at all times and original signed forms kept by the Project Manager in the project files. Subcontractor personnel shall also sign Health and Safety Plan Acknowledgements if they are working under the subcontractor Project Health and Safety Plan.

The preceding requirements are those that must be satisfied for any subcontractor field work regardless of the site. There are also several training requirements to satisfy the site specific requirements of both the subcontractor and EG&G. These site specific requirements include

- EG&G Radiation Workers for Environmental Restoration Safety Training
- EG&G Waste Generator Non PA Training Course (for packaging waste)

FIGURE 6 1 HEALTH AND SAFETY PLAN ACKNOWLEDGEMENT FORM



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## HEALTH AND SAFETY PROGRAM HEALTH AND SAFETY PLAN ACKNOWLEDGEMENT

Project Number \_\_\_\_\_

Project Name \_\_\_\_\_

Project Location \_\_\_\_\_

I hereby acknowledge that I have been given a safety briefing on the work I am to do on the above-referenced site. I understand that the site may contain materials classified by EPA or others as potentially hazardous. I have read and understand the safety plans for this project and will adhere to the procedures contained therein. I have been instructed in and understand the use of the safety equipment for this project.

Employee

Date \_\_\_\_\_

Print Name \_\_\_\_\_

Signature \_\_\_\_\_

Project Manager or Representative

Date \_\_\_\_\_

Print Name \_\_\_\_\_

Signature \_\_\_\_\_

All operations personnel will receive site specific training pertaining to chemicals and materials used in the operation of the OU1 groundwater treatment facility regarding the routes of exposure and adverse health effects

## **6 2 MEDICAL MONITORING**

In accordance with the 29 CFR 1910 all employees assigned to a field project at a hazardous waste site shall be part of a Medical Monitoring Program The Project Manager shall be responsible for verifying the current medical monitoring status for all employees assigned to the project Any deficiencies shall be cleared prior to the employee doing any field work on the field project Medical qualification records will be submitted to EG&G for maintenance on site

## **6 3 DAILY SAFETY BRIEFINGS**

As described in Section 6 1 all workers shall receive a safety briefing on the contents of this plan prior to beginning work In addition a health and safety briefing shall be performed at the beginning of each shift The briefing shall be conducted by the shift Health and Safety Officer and shall cover the specific tasks to be performed for that shift Health and safety concerns for planned tasks shall be reviewed and required procedures discussed The attendees at the briefing and the items discussed shall be documented in the daily Safety Briefing Report shown on Figure 6 2 A supply of blank Safety Briefing Forms will be kept in the operations office for OU1

## **6 4 POSTING AND SITE ACCESS**

The Rocky Flats Plant site is a controlled access area with the OU1 treatment facility located inside the perimeter Rocky Flats fencing Access to the treatment facility is through the office at the facility and requires proper badging and clearance including a personal dosimeter Access to the OU1 treatment facility shall be limited to

FIGURE 6 2 SAFETY BRIEFING REPORT


	<b>RESOURCE TECHNOLOGIES GROUP INC</b>	<h2 style="margin: 0;">HEALTH AND SAFETY PROGRAM</h2> <h3 style="margin: 0;">SAFETY BRIEFING REPORT</h3>	Page 1 of 2																		
Project Number _____		Name _____																			
Project Location _____																					
Project Manager _____																					
Site Health and Safety Officer _____																					
Date _____		Weather _____																			
<b><u>Task Specific Safety Requirements</u></b>																					
Task _____																					
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Safety Requirements _____																					

FIGURE 6 2 (CONTINUED)



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GROUP INC

# HEALTH AND SAFETY PROGRAM SAFETY BRIEFING REPORT

Page 2 of 2

## Task Specific Safety Requirements

Task \_\_\_\_\_

Personnel

Name

Assignment

_____	_____
_____	_____
_____	_____

Safety Requirements \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

## Task Specific Safety Requirements

Task \_\_\_\_\_

Personnel

Name

Assignment

_____	_____
_____	_____
_____	_____

Safety Requirements \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Briefing Acknowledgement

Printed Name

Signature

_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

Briefing Conducted By

_____	_____
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The subcontractor operations and supervisory personnel in addition to appropriate EG&G personnel Any maintenance or other personnel will be trained in accordance with the requirements presented in this section and also be accompanied by an operator

## **6 5 BUDDY SYSTEM**

All work which requires an operator to directly handle sample or transport hazardous materials hazardous waste or waste containers at Rocky Flats requires the use of the buddy system This includes process chemical preparation drum or chemical transfers and maintenance The buddy system ensures that each worker is observed by another worker who can provide rapid assistance in case of emergency In addition any work requiring greater than Level D protection requires use of the buddy system Operators may monitor controls and gauges in the plant without use of the buddy system provided radio contact is maintained with the roving foreman At no time shall any worker engage in any kind of emergency response without the use of the buddy system Workers shall immediately evacuate the danger area upon discovery of a potential emergency situation

## **7 0 EMERGENCY RESPONSE PLAN**

This project involves the operation of an existing water treatment plant. Potential emergency situations during work at the OU1 Groundwater Treatment Facility include fire, hazardous substance release, employee contamination, accidents, and injuries. Safety precautions will be taken to avoid emergency situations. However, if an emergency does arise, the procedures described in this section will be followed. Also, preparatory steps necessary for responding to an emergency situation are given below and they should be complied with before beginning any work at the site.

EG&G maintains an emergency response telephone extension of **2911** at Rocky Flats plant. Extension **2911** may be reached from any plant site telephone system instrument and will immediately connect the caller with the Fire Department, the Central Alarm Station, the Shift Superintendent, and during first shift, Occupational Health.

### **7 1 FIRE**

All personnel should move or be moved to a safe distance from any area involved in a fire situation. The EG&G emergency extension at **2911** shall be called immediately. The Subcontractor Shift Foreman shall immediately notify the subcontractor and EG&G personnel as shown on page 7 8.

### **7 2 HAZARDOUS SUBSTANCE RELEASE**

#### **7 2 1 Definitions**

**EMERGENCY RESPONSE** action is a response effort to an occurrence which results or is likely to result in an uncontrolled release of hazardous materials or substances. This does not include response to incidental releases of hazardous materials or substances.

An **EMERGENCY RESPONSE** involves support efforts by employees from outside the immediate release area or by designated responders (e g HAZMAT Team or Radiological Assistance Team)

**INCIDENTAL RELEASE** includes spills leaks or other releases where the substance can be safely absorbed neutralized or otherwise controlled by employees or maintenance personnel in the immediate release area at the time of the release It also includes releases of hazardous substances for which there is no potential safety or health hazard (i e fire explosion or chemical exposure) above the normal operating conditions in the work area Use of additional personal protective equipment (e g chemical cartridge respirators) not used during normal work activities is not allowed

**RELEASE** means any spilling leaking pumping pouring emitting emptying discharging or dumping of a hazardous material or hazardous waste in any building/containment or to the environment

**REPORTABLE RELEASE** are all solid and liquid releases of a hazardous material or a hazardous substance greater than or equal to **one pound** (or **one pint** for aqueous liquids) and all gaseous (gas/vapor) releases that threaten or occur inside or outside of any building/containment and that are unplanned

A list of hazardous and extremely hazardous substances (including radionuclides) is included as Attachment 1 to Section 4 0 of the Hazardous Waste Requirements Manual 1 10000 HWR

## **7 2 2 Groundwater Treatment Facility Release Hazard Analysis**

Table 7 1 contains a hazard analysis of all materials at the Groundwater Treatment Facility that have the potential to be released and the appropriate level of personal protective equipment required for spill response

**TABLE 7 1**  
**SPILL RESPONSE HAZARD ANALYSIS**

<b>MATERIAL SPILLED</b>	<b>SPILL PROCEDURES</b>	<b>PERSONAL PROTECTIVE EQUIPMENT REQUIRED</b>
Hydrochloric Acid	Flush with water neutralize with soda ash or lime only with adequate ventilation as carbon dioxide is generated eliminate sources of ignition as hydrogen gas may be generated place in appropriate container for disposal	Level D Work clothes with plastic coated Tyvek safety shoes with neoprene boot covers safety glasses with full face shield elbow length neoprene or butyl gloves Level B No entry without SCBA in event of a spill of concentrated hydrochloric acid
Sodium Hydroxide	Flush with water neutralize with dilute acid pick up spill with vacuum or pumping equipment place in appropriate container for disposal	Level D Work clothes with plastic coated Tyvek or apron elbow length neoprene gloves and overboots safety glasses will full face shield
Hydrogen Peroxide	Flush area with water place in appropriate container for disposal	Level D Work clothes with plastic-coated Tyvek safety shoes with neoprene boot covers safety glasses with full face mask neoprene or butyl gloves SA or SCBA <sup>b</sup> required if monitoring indicates levels above TWA of 1 ppm
Liquid Nitrogen	Shut off leak if it can be done without risk of skin contact and if ventilation is adequate Evacuate area until ventilation can restore a safe oxygen level Allow spilled liquid to evaporate	Level D Work clothes with insulated gloves safety goggles If spill is significant amount in a small area oxygen deficiency is a hazard and use of SCBA may be required
Ion Exchange Resin	Sweep up Ion exchange resin on smooth surfaces may be slippery place in appropriate container for storage or disposal	Level D Work clothes safety glasses with side shields safety shoes

**Notes**

Supplied Air

<sup>b</sup>

Self Contained Breathing Apparatus

**TABLE 7 1 (Continued)**  
**SPILL RESPONSE HAZARD ANALYSIS**

<b>MATERIAL SPILLED</b>	<b>SPILL PROCEDURES</b>	<b>PERSONAL PROTECTIVE EQUIPMENT REQUIRED</b>
Nitrogen (Compressed Gas)	Evacuate and ventilate area Contact RFP HAZMAT (ext 2911) Ensure oxygen levels are above 19.5% Remove the leaking cylinder to a safe outdoors area if this can be done safely	Level D Work clothes with safety shoes and safety glasses Emergency response personnel to determine if oxygen deficiency is a hazard prior to entry
Hydrogen (Compressed Gas)	Shut off ignition sources due to fire and explosion hazard Contact RFP HAZMAT (ext 2911) Evacuate and ventilate area Ensure oxygen levels are above 19.5% Ensure combustible gas level are below 10% LEL Remove the cylinder to a safe outdoors area if this can be done safely	Level D Work clothes with safety shoes and safety glasses Emergency response personnel to determine combustible gas levels and if oxygen deficiency is a hazard prior to entry
Helium (Compressed Gas)	Evacuate and ventilate area Contact RFP HAZMAT (ext 2911) Ensure oxygen levels are above 19.5% Remove the leaking cylinder to a safe outdoors area if this can be done safely	Level D Work clothes with safety shoes and safety glasses Emergency response personnel to determine if oxygen deficiency is a hazard prior to entry
Air (Compressed Gas)	Evacuate and ventilate area Remove the leaking cylinder to a safe outdoors area if this can be done safely	Level D Work clothes with safety shoes and safety glasses

### **7 2 3 Initial Response Requirements**

If an employee properly trained in accordance with the requirement in Section 6 0 discovers an incidental release in his/her work area and is knowledgeable of the associated hazards the employee may take immediate action to contain and/or control the release (e g shut a valve to stop the flow) Such action shall not be undertaken without the presence of the shift foreman in accordance with Section 6 5 An incidental release may be cleaned up as part of the first response actions

**Note Action should only be taken if the employee can perform them in a safe manner, without endangering himself/herself or others**

If the spill or release is life threatening or involves a fire the Shift Foreman shall immediately call the Plant Emergency Number (extension 2911) All other spills and releases shall be immediately reported to EG&G and the subcontractor supervision who will assess the event or condition to determine if an emergency response is required Supervision may request assistance as required of support groups (e g Industrial Hygiene Radiological Engineering etc ) to make this determination

If the event or condition requires an emergency response supervision shall immediately call the Plant Emergency Number (extension 2911 for life threatening emergencies) or the Shift Superintendent (extension 2914 for non life threatening emergencies) for assistance Containment measures shall only be performed by personnel with First Responder Operations Level training Following containment of the spill adequately trained Groundwater Treatment Facility operations personnel or HAZMAT team members may perform cleanup operations

### **7 3 EMPLOYEE CONTAMINATION**

If any site worker experiences a failure or alteration of protective equipment that affects the protection factor that person and his/her coworker(s) will immediately leave the work area for which the PPE was required. Re entry to the secondary containment area will not be permitted until the equipment has been repaired or replaced. If any other incidents occur that involve the contamination or exposure of an employee to hazardous or toxic substances the EG&G emergency extension at 2911 shall be notified immediately to dispatch the appropriate emergency personnel.

First aid or other decontamination procedures should be administered if they can be without endangering other operations personnel. A first aid kit will be located in the office area of the treatment facility. The Shift Foreman or operator shall notify EG&G and the subcontractor supervision immediately.

### **7 4 ACCIDENT/INJURY**

In the event of an accident or other event that causes injury to operations or any other personnel present at the OU1 site the EG&G emergency extension at 2911 shall be notified immediately. The site Fire Department, EMTs and Security will be dispatched immediately. Details of the emergency and the exact location must be given over the phone. Basic first aid may be administered by the subcontractor personnel until emergency medical assistance is available. Each shift will have a minimum of one subcontractor staff member trained in American Red Cross First Aid and CPR. A first aid kit will be kept in the office of the Groundwater Treatment Facility. Any non emergency medical situation such as minor cuts or sprains should be attended to at

EG&G Medical Building 122

The subcontractor Shift Foreman or operator shall immediately notify EG&G and the subcontractor supervision of any accident or injury.



## **7 5 COMMUNICATIONS**

The OU1 groundwater treatment facility consists of the treatment plant inside Building 891 and associated tankage outside the building in close proximity. The small work area and requirement of the buddy system during work activities allows face to face communication among workers. A phone is located in the office area of the treatment facility for communication in emergencies. Any work required at other areas of the EG&G plant site require the availability of two way radios for emergency use. The on site emergency phone number is 2911 which is the EG&G emergency extension.

## **7 6 INCIDENT REPORTING**

The following list of supervisory personnel and their telephone numbers will be posted by the telephone(s) closest to ongoing field activities. One EG&G and subcontractor staff member will be notified using the call in order listed of any spill, release, personnel contamination, accident or injury, major equipment failure or out of specification discharge.

## **EMERGENCY TELEPHONE NUMBERS**

### **EG&G OU1 Emergency Contacts**

### **Telephone Number**

**Contact** Russ Cirillo

EG&G Phone 966 5876  
Pager 5177

**Back-up** Mark Burmeister

EG&G Phone 966 5891  
Pager 4630

**Back-up** Ty Vess

EG&G Phone 966 6540  
Pager 5476

**Back-up** Marla Broussard

EG&G Phone 966-8517  
Pager 4010

**If none of the EG&G personnel listed above are available, contact the EG&G Shift Superintendent at 966 2914**

### **EG&G Emergency Response Extension 2911**

### **RTG OU1 Emergency Contacts**

#### **RTG Project Manager**

**Contact** Mike Griffin

RTG Phone 969 8511

#### **RTG Health and Safety Officer**

**Contact** Bart Conroy

RTG Phone 969 8511

#### **RTG Program Manager**

**Contact** Erich Tiepel

RTG Phone 969 8511

#### **RTG Site Health and Safety Officer**

**Contact** David Barnes

RTG Phone 966-4310

## **8 0 PERSONAL PROTECTIVE REQUIREMENTS**

The purpose of personal protective equipment (PPE) including clothing is to shield or isolate individuals from the chemical physical and biological hazards that they may encounter at sites containing hazardous or toxic materials. The careful selection and use of PPE will protect the respiratory system skin eyes face hands feet head body and hearing.

No single combination of protective equipment and clothing is capable of protecting against all hazards and PPE must be used in conjunction with other protective methods. The use of PPE can in itself create significant worker hazards such as heat stress physical and psychological stress impaired vision mobility and communication.

Specific protective garments are selected on the basis of a variety of criteria. In general the greater the level of PPE the greater the associated risks. For any given situation equipment and clothing must be selected to provide an adequate level of protection. Over protection as well as under protection can be hazardous and should be avoided.

Table 8 1 summarizes PPE requirements for specific tasks associated with operation of the groundwater treatment facility. Non routine tasks which are not addressed in Table 8 1 will be addressed on a case by case basis by the subcontractor and the appropriate level of PPE will be determined with approval by EG&G. The following sections detail the criteria for selecting specific personal protective equipment (PPE) which will apply to this project.

**TABLE 8 1**  
**Personal Protective Equipment Summary**

Task	Level	Body	Foot	Head <sup>1</sup>	Eye	Hand	Respirator <sup>2</sup>
Operation of UV/H <sub>2</sub> O	D	Work Clothes	Safety shoes	None Required	Safety Glasses	None Required	None required
Filling H O feed tank or working with H O feed system	D	Work Clothes	Safety shoes	None Required	Full face splash shield	Nitrile outer gloves with latex inner glove liners	None required
Changing UV bulbs in UV/H O system	D	Work Clothes	Safety shoes	None Required	Safety Glasses	Leather work gloves	None required
Operation of IX	D	Work Clothes	Safety shoes	None Required	Safety Glasses with side shields	None required	None required
Operation of degasifier column	D	Work Clothes	Safety shoes	None Required	Safety Glasses with side shields	None required	None required
Operation of motorized pumps to transfer fluids	D	Work Clothes	Safety shoes	None Required	Safety glasses with side shields	Leather work gloves	None required
Removal and replacement of filter bags	D	Work Clothes	Safety shoes	None required	Safety glasses with side shields	Nitrile gloves	None required
Cleaning UV lamps and changing bulbs	D	Work Clothes	Safety shoes	None Required	Safety glasses with side shields	Nitrile gloves	None required
Regeneration of IX columns	D	Work Clothes	Safety Shoes	None Required	Safety glasses with side shields	Nitrile gloves	None required

**TABLE 8 1 (Continued)**  
**Personal Protective Equipment Summary**

<b>Task</b>	<b>Level</b>	<b>Body</b>	<b>Foot</b>	<b>Head<sup>1</sup></b>	<b>Eye</b>	<b>Hand</b>	<b>Respirator<sup>2</sup></b>
Calibration of flow meters and pumps	D	Work Clothes	Safety shoes	None Required	Safety glasses	None required	None required
Collecting water samples	D	Work Clothes	Safety shoes	None Required	Safety glasses with full face splash shield	Nitrile gloves	None required
Repair or disassembly of process piping or opening of oxidation chamber	D or C	Work Clothes	Safety shoes with latex boot covers	Hardhat	Splash proof goggle	Nitrile outer gloves with latex inner liners	May require APR with MSA GMC H cartridges or equivalent if VOCs > 1 ppm in breathing zone
Clean up of small spills	See Table 7 1	See Table 7 1	See Table 7 1	See Table 7 1	See Table 7 1	See Table 7 1	See Table 7 1
Miscellaneous maintenance work	D	Work Clothes	Safety shoes	Hardhat	Safety glasses	None required or leather work gloves as needed	None required
Filling acid/caustic tanks	D or C	Work Clothes with protective apron	Safety shoes	None required	Splash proof goggles or full face splash shield	Elbow length nitrile gloves	None required unless there is a spill
Handling liquid nitrogen	D	Work Clothes	Safety shoes	None required	Splash proof goggle	Leather work gloves	None required

<sup>1</sup> The Subcontractor Health and Safety Officer and EG&G shall specify hardhat areas

<sup>2</sup> Respiratory protection requirements based upon continuing monitoring for airborne contaminations as discussed in Section 8 0

## **8 1 CLOTHING**

The use of Level D protective equipment is defined by the following criteria

- No contaminants are present or contaminants are present below the action levels established in the HASP for respirator use and
- Work functions preclude splashes immersion or potential for unexpected inhalation of any chemicals

Experience with previous treatment operations indicates that the chance of encountering contamination in the work area is minimal given the low concentration of contaminants Therefore Level D protection will be adequate during most normal work activities This is a field work uniform affording minimal protection consisting of the following PPE

- Safety boots leather or chemical resistant with steel toe and shank (not required for non working supervisory personnel or casual visitors under escort)
- Safety glasses (ANSI Z87 1 1989 compliant) with side shields or goggles

The following additional PPE may be required as part of Level D protection depending on the specific tasks being performed

- Coveralls
- Work gloves
- Hard hat with face shield

In addition proper chemical resistant gloves shall be worn when handling process treatment chemicals Face shields and aprons shall also be worn during operations with the potential for splashing A poly coated Tyvek suit may also be worn if the splashing potential is judged to be high

Tank top shirts shorts and tennis shoes are not permissible PPE shall meet the requirements applicable to ANSI and OSHA standards Where appropriate and more stringent the subcontractor will comply with EG&G Rocky Flats Plant PPE requirements Modifications or substitutions of the PPE specified herein shall be subject to written approval by EG&G

If air monitoring as described in Section 9.0 indicates the presence of organic vapors in excess of action levels Level C PPE may be required The PPE for Level C shall include the following

- Full face air purifying respirator with appropriate cartridges or canisters
- Chemical resistant clothing consisting of

coveralls

hooded one or two piece chemical splash suit or

chemical resistant hood and apron or

disposable chemical resistant coveralls

inner and outer chemical resistant gloves and

chemical resistant safety boots with steel toes

#### Optional

hard hat

outer disposable chemical resistant boot covers

face shield

2 way intrinsically safe radios

long cotton underwear

The criteria to evaluate when considering whether Level C PPE is required include the following

- Oxygen concentrations are greater than 19.5 percent and less than 23.5 percent by volume
- Measured air concentrations of identified substances will be reduced by the respirator below the PEL, TLV or REL and the concentration is within the service limit of the cartridge
- Atmospheric contaminant concentrations do not exceed IDLH levels
- Atmospheric contaminants, liquid splashes or other direct contact will not adversely affect anyone left unprotected by chemical resistant clothing
- Job functions do not require self contained breathing apparatus and
- Continuous direct readings on monitoring instruments such as FIDs or PIDs are within the action levels prescribed in the HASP for air purifying respirator use

The main selection criterion for Level C as opposed to the more restrictive Level B is that conditions permit wearing air purifying respirators. Cartridges must be able to remove the substances encountered.

A full face air purifying respirator can be used only if

- The substance has adequate warning properties
- The individual using the mask has passed at least a qualitative fit test
- The individual has medical clearance for the use of respirators and
- The appropriate cartridge is used and its service limit concentration is not exceeded



The chemical and radiological hazards expected to be encountered at the OU1 Groundwater Treatment Facility were discussed previously in Section 5.0 and presented on Tables 5.2, 5.3, 5.4 and 5.5. It is apparent from reviewing this information that supplied air respirators are necessary. These are not maintained at the facility. In the event that their use is required, the subcontractor personnel would evacuate and personnel trained in the use of Level B would be required to respond. If experience and data indicate that the contaminants are significantly different than those discussed in Section 5.0, then the respiratory protection requirements must be reevaluated.

An air surveillance program is part of all hazardous material/waste site operations when atmospheric contamination is known or suspected. It is mandatory that the ambient air be thoroughly and continuously monitored when personnel are wearing air purifying respirators. Surveillance using a photoionization detector (PID), colorimetric tubes, or other air sampling equipment in accordance with the HASP is required during all Level C and B operations to detect changes in air quality necessitating a higher level of respiratory protection. Level C protection with an air purifying respirator will be worn routinely in an atmosphere only after the type of air contaminant is identified, concentrations measured, and the criteria for wearing air purifying respirators are met.

## **8.2 RESPIRATORY PROTECTION**

The requirements for respiratory protection have been discussed briefly in Section 8.1 and will be presented in greater detail in this section. Respiratory protection requirements shall be based on air monitoring data. Air quality shall be monitored with a photoionization detector (PID) equipped with an 11.7 eV lamp, colorimetric tubes, or personal air samplers. Action levels for respiratory protection shall be as follows:

- As can be seen from the data in Table 5.1, there is the potential for several Volatile Organic Compounds (VOCs) to be present in the wastewater to be treated. These VOCs and their respective permissible exposure limits (PEL) are

<u>Compound</u>	<u>PEL</u>
Methylene Chloride	500 ppm
Acetone	750 ppm
Carbon Disulfide	4 ppm
1 1 Dichloroethylene	1 ppm
1 1 Dichloroethane	100 ppm
1 2 Dichloroethene	200 ppm
1 1 1 Trichloroethane	350 ppm
Carbon Tetrachloride	2 ppm
Trichloroethylene	50 ppm
1 1 2 Trichloroethane	10 ppm
Tetrachloroethylene	25 ppm
Toluene	100 ppm

- Table 5 2 presents analytical data from influent sampling performed from April 1992 to September 1992 This data shows the following significant contaminants normally present in the wastewater and the associated PEL

<u>COMPOUND</u>	<u>PEL</u>
Tetrachloroethene	25 ppm
Trichloroethene	50 ppm

Exposure to the VOCs listed would occur only when breaking the integrity of the UV/H<sub>2</sub>O<sub>2</sub> system influent piping (e g system maintenance or sampling) When necessary to perform maintenance on the influent system or perform system sampling recent waste water influent samples shall be reviewed for actual contaminants and concentrations present Air monitoring of void spaces (e g UV/H<sub>2</sub>O<sub>2</sub> unit) after draining and the immediate work area when performing influent sampling will be accomplished with a PID Should the PID indicate levels above 50% of the most limiting PEL (25 ppm for Tetrachloroethene) monitoring with colorimetric tubes or personal air samplers may also be determined to be necessary to supplement data concerning specific compounds Analysis of cartridges from personal air samplers would be performed for the compounds of interest by an independent industrial laboratory approved by EG&G Following completion of characterization of the compounds present the appropriate air monitoring

administrative controls and personal protective equipment regimes would be determined with the approval of EG&G

The atmosphere in the treatment facility will be monitored weekly when the system is operational with a calibrated PID and if detectable levels are measured at 50% of the most limiting PEL the work area shall be evacuated immediately. The area will then be evaluated to determine the compound(s) present by personnel wearing the appropriate respiratory protection. The subcontractor Health and Safety Officer, Project Manager and the Project Health and Safety Officer will review the results of this evaluation to determine whether engineering controls can be installed to minimize the concentration of VOCs. If engineering controls can be utilized they will be recommended and installed upon approval.

If engineering controls are not practical work may continue only after air monitoring results are completed and with the concurrence of the subcontractor Health and Safety Officer and EG&G.

### **8.3 GENERAL REQUIREMENTS FOR PROCESS CHEMICAL HANDLING**

Hydrogen peroxide is routinely used during waste treatment in the UV/H<sub>2</sub>O<sub>2</sub> system. During regeneration of the ion exchange resins the treatment facility uses hydrochloric acid and sodium hydroxide in bulk quantities. Direct contact with all chemicals shall be prevented with the use of chemical resistant personal protective equipment as described in Table 8.1 and Section 8.1 Clothing to include chemical resistant boots, gloves, apron and face shield. The subcontractor operations personnel shall ensure that the emergency shower and eyewash are in operable condition prior to handling process chemical materials. Emergency eyewash and shower facilities shall be inspected and the condition documented at least once per week. Handling and transfer of chemicals shall not be performed by personnel wearing contact lenses. Transfer of chemicals shall be performed only within approved secondary containment areas of the groundwater.

treatment facility Chemicals should never be mixed outside the parameters given in the Operations and Maintenance Manual

#### **8 4 GENERAL REQUIREMENTS FOR CHEMICAL STORAGE**

Chemicals shall be stored in the approved chemical storage tanks to prevent inadvertent mixing of incompatible materials Container labeling shall be maintained in accordance with EG&G Rocky Flats requirements and the NFPA hazard warning system

#### **8 5 CONFINED SPACE ENTRY**

Posting of and entry into Confined Spaces will be performed according to EG&G Confined Space Entry procedures by personnel who have received the appropriate EG&G training

#### **8 6 COMPRESSED GAS HANDLING AND STORAGE**

The treatment facility includes a gas chromatograph which uses compressed gases Specifically these gases include nitrogen helium hydrogen and air Cylinders will be stored handled transported and used in accordance with the requirements contained in 29 CFR 1910 101 Compressed Gases 29 CFR 1910 103 Hydrogen and HSP 11 01 Compressed Gas Cylinders

## **9 0 AREA MONITORING**

Monitoring of the environmental conditions in and around OU1 must occur because of the potential for contaminants to be present in environmental media the water being treated filters and ion exchange resins The following sections describe the monitoring program to be implemented and appropriate exposure limits and actions levels Where feasible personnel exposures to hazardous materials (other than radioactive substances) shall be maintained within the TLVs adopted by the ACGIH or the PELs adopted by OSHA whichever is more stringent Exposure to radioactive material will be maintained below the EG&G administrative limits Table 9 1 presents a summary of the monitoring program

## **9 1 CHEMICAL MONITORING**

Air monitoring shall be conducted in and around the OU1 facility using a PID device with at least an 11 5 eV lamp at a minimum of once weekly and during the following tasks when sampling water when changing bag filters and when changing or cleaning UV bulbs These devices are used to monitor for the presence of volatile organic compounds PID devices are used as a screening instrument to detect the presence of organic compounds but cannot quantify or identify specific organic substances The PID will be calibrated with a 100 ppm standard of isobutylene prior to use If any reading above 50% of the most limiting PEL is found the Health and Safety Officer will investigate to determine the source and will make the necessary changes to reduce the concentration below 50% of the PEL Monitoring with colorimetric tubes and/or personal air samplers to determine the compound(s) present may be necessary Monitoring will be performed should the subcontractor find it necessary to break the integrity of the influent system as discussed in Section 8 2

**TABLE 9 1**

**Monitoring Program Summary**

Hazard/Sample Type	Action Level	Precaution If Action Level is Exceeded	Monitoring Frequency
<b>RADIATION</b>			
Equipment and material contamination	Alpha contamination > 20 dpm/100cm <sup>2</sup> removable > 300 dpm/100cm <sup>2</sup> total  Beta/gamma contamination > 1000 dpm/100cm <sup>2</sup> removable > 5000 dpm/100cm <sup>2</sup> total	Equipment and material decontamination	Prior to removal from radiological control area
Personnel contamination	Background	Personnel decontamination	Prior to exiting access control
Long lived radioactive airborne particulates	10% of the DAC (if respirators not worn)	Full face piece air purifying respirators (APRs) with HEPA cartridges	As determined by EG&G
External shallow beta/gamma radiation exposure rate	> 5 mrem per hour	Remove personnel from elevated beta/gamma exposure rate area and investigate source	As specified in Section 9 2 3
<b>CHEMICAL</b>			
Air monitoring for volatile organic compounds	50% of the most limiting PEL for compounds present	Full face air purifying respirators with organic vapor acid fumes cartridges	As specified in Section 9 1
<b>MISCELLANEOUS MONITORING</b>			
<b>NOISE</b>			

Area	85 decibels 8 hour Time Weighted Average (TWA)	Suitable hearing protection	At discretion of the subcontractor Health and Safety Officer and EG&G IH
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**TABLE 9 1 (Continued)**  
**Monitoring Program Summary**

<b>HEAT STRESS</b>			
Oral and heart rate monitoring <sup>b</sup>	Oral temperature 38 C (99.6 F) heart rate 110 bpm	Use of ice vests reduce work cycle duration or other EG&G approved measures	Monitoring frequency will be dependent on work area temperature and at the discretion of the subcontractor Health and Safety Officer and EG&G IH

DAC Derived Air Concentration

<sup>b</sup> Monitoring will be performed when work area temperature exceeds 85 F and coveralls or protective clothing is being worn

Work can be resumed provided that the monitoring results can be reduced to less than 50% of the PEL. If readings are more than 50% of the PEL, it will be necessary to don respiratory protection and to investigate to determine the compound(s) present, the source of the compound, and whether the use of engineering controls can reduce concentrations to less than 50% of the PEL.

Air monitoring may also be done utilizing colorimetric tubes for any of the VOCs present. Any indication of concentrations exceeding the PEL for a specific compound will require work to stop unless Level C respiratory protection (full face APR) is donned.

Compliance with limits on airborne metal contaminants can be reasonably assured if dust concentrations in the worker breathing zone are kept under control.

## **9 2 RADIOLOGICAL MONITORING**

The radiation exposure of an occupational worker will be maintained as far below the U.S. Department of Energy (DOE) limits as is reasonably achievable. An EG&G annual administrative dose equivalent level of 1,800 mrem committed effective dose equivalent



will be in effect. If any worker exceeds the administrative dose equivalent level, a comprehensive evaluation will be performed and if necessary, the employee will be reassigned to a job where his or her radiation exposure will not exceed an additional 100 mrem for the remainder of the calendar year.

### **9.2.1 Personnel and Equipment Contamination**

Personnel and equipment leaving the radiologically controlled area will be monitored for radiological contamination in accordance with the action levels specified in Table 9.1. Release of all equipment and materials from a radiologically controlled area will be in accordance with EG&G Procedures HSP 18.10 and EMRG 3.02. Instrumentation used for personnel and equipment contamination monitoring will be those recommended by EG&G Radiological Engineering. Any alternates will be approved by the HSS and EG&G Radiological Engineering.

### **9.2.2 Radioactive Air Particulate Monitoring**

EG&G is responsible for air sampling for radioactive airborne particulates. These samples will be taken in the breathing zone of workers, within the work zone, and outside the work zone.

Workers may be required to wear personal air monitoring devices to sample for radioactive particulates in the worker's breathing zone. Air sampling in the work areas will be performed at the discretion of EG&G. Area sampling may also be performed in locations within and outside the work zone.

### **9.2.3 External Beta/Gamma Radiation Monitoring**

After successful completion of the medical and training requirements specified in Section 6.0 of this plan, all employees who will work within the controlled area will be issued

radiation monitoring badges by EG&G Dosimetry. These badges are required only when performing tasks such as ion exchanger resin replacement and are not necessary for access to Building 891.

#### **9 2 4 Internal Radiation Exposure (Bioassay) Monitoring**

The subcontractor employees who are issued radiation monitoring badges are subject to periodic urine and/or fecal samples at the discretion of EG&G. Additional urine and/or fecal bioassay samples may be required at the discretion of EG&G if a substantial exposure is suspected. These samples will be analyzed for radionuclides to determine whether the employee has received an internal radiation dose while performing work at OU1. Sample containers will be provided by EG&G.

### **9 3 MISCELLANEOUS MONITORING**

#### **9 3 1 Noise Monitoring**

Sound pressure levels shall be monitored to delineate hearing protection areas. Monitoring frequency will be at the discretion of the subcontractor Health and Safety Officer. Additionally, a personal noise dosimeter may be used in conjunction with a sound level meter in order to assess noise exposures of selected individuals based upon area monitoring. Suitable hearing protection shall be worn in areas with noise levels greater than 85 decibels. The subcontractor personnel shall be required to follow the requirements of an effective hearing conservation plan including audiometric testing if working in an area requiring hearing protection.

### **9 3 2 Heat Stress Monitoring**

Monitoring will generally consist of periodic measurement of workers body temperature and heart rate during periods when work area temperatures exceed 85°F and protective coveralls are required to be worn. Monitoring frequency will be determined by the subcontractor Health and Safety Officer and EG&G Industrial Hygiene and will depend on the work area temperature and the type of work being performed.

## 10 0 SITE CONTROL

Within the controlled access area there are restricted and unrestricted areas. In general, controlled access areas in which radioactive or chemical contamination is present above established guidelines are restricted areas. Restricted area signs have been posted indicating the nature of contamination present in each of these areas. Controlled access areas in which site characterization data has indicated that no significant chemical and radiological hazard is present are unrestricted areas. Subcontractor personnel shall not be permitted access to restricted areas of the site other than those included in the scope of this project unless specifically authorized access by EG&G. Access to all areas posted as confined spaces shall be in accordance with established EG&G Procedures.

Access to the OU1 groundwater treatment facility shall be controlled by the subcontractor operations personnel when present. A log in sheet located in the facility office will be implemented to record the presence of all personnel including visitors. The subcontractor Operators will be responsible for escorting visitors and providing a short documented briefing concerning hazards associated with visiting the groundwater treatment facility.

**APPENDIX A**  
**Material Safety Data Sheets**

# Material Safety Data Sheet

from Genium's Reference Collection  
Genium Publishing Corporation  
1145 Catalyn Street  
Schenectady NY 12303 1836 USA  
(518) 377-8855



No 30A

HYDROCHLORIC ACID  
(Revision B)  
Issued October 1977  
Revised November 1988

## SECTION 1 MATERIAL IDENTIFICATION

27

Material Name HYDROCHLORIC ACID

Description (Origin/Uses) Used in the production of chlorides in refining ore in the production of tin and tantalum for the neutralization of bases for pickling and cleaning metal products for oil and gas-well treatments and in removing scale from boilers and heat-exchange equipment.



Other Designations: Aqueous Hydrogen Chloride Muriatic Acid  $\text{HCl}$   $\text{H}_2\text{O}$  CAS No 7647-01-0

HMIS  
H 3 R 1  
F 0 I 4  
R 0 S 4  
PPG  
See sect. 8 K 0

Manufacturer: Contact your supplier or distributor. Consult the latest edition of the *Chemicalweek Buyers Guide* (Genium ref 73) for a list of suppliers.

## SECTION 2 INGREDIENTS AND HAZARDS

Hydrogen Chloride, CAS No 7647-01-0

38 or Less

## EXPOSURE LIMITS

OSHA PEL  
Ceiling, 5 ppm, 7 mg/m<sup>3</sup>

Water

Balance

ACGIH TLV 1983-89  
TLV-Ceiling 5 ppm, 7 mg/m<sup>3</sup>

Impurities such as iron, chlorine, and traces of organic matter may be present in small amounts depending on the grade of acid.  
See NIOSH RTECS (MW4025000) for additional data with references to reproductive and mutagenic effects. Continue to monitor NIOSH, RTECS (MW40300000) for toxicity data on hydrochloric acid itself.

Toxicity Data:  
Human, Inhalation, LC<sub>50</sub> 1300 ppm (90 Mins)  
Rat, Inhalation LC<sub>50</sub> 3124 ppm (1 Hr)  
Rabbit, Oral, LD<sub>50</sub> 900 mg/kg

## SECTION 3 PHYSICAL DATA

Boiling Point 227°F (109°C) (20.22%)

Melting Point 85°F (65°C) (20.69%)

Vapor Density (Air = 1) 1.268

pH Strong Mineral Acid

Molecular Weight, Not Applicable  
Solubility in Water (%) Complete  
Specific Gravity ( $\text{H}_2\text{O} = 1$ ) >1  
% Volatile by Volume: Ca 100

Appearance and Odor: A clear colorless-to-lightly yellowed, fuming liquid sharp pungent, characteristic, irritating odor of hydrogen chloride gas. This odor is detectable at 1 to 5 ppm and becomes unpleasant and irritating at 5 to 10 ppm, however the odor serves as a good warning property.

Comments: The specific physical properties of aqueous hydrochloric acid solutions vary with the amount of dissolved hydrogen chloride gas. Hydrochloric acid forms a constant boiling azeotrope (a mixture of hydrochloric acid and water that behaves like a single substance in that its vapor has the same composition as the mixture itself) with water (at 227°F or 109°C) that contains 20.22% hydrogen chloride and has a density of 1.096. Boiling weaker or stronger aqueous solutions results in the loss of either component until the constant boiling acid is produced.

## SECTION 4 FIRE AND EXPLOSION DATA

LEL

UEL

Flash Point and Method

Autoignition Temperature

Extinguishing Media: Hydrochloric acid solutions do not burn. Use extinguishing agents that will put out the surrounding fire. Unusual Fire or Explosion Hazards: Use a water spray to cool fire-exposed containers of hydrochloric acid to prevent ruptures. Explosive hydrogen gas can be produced by the reaction of hydrochloric acid with metals such as iron. Neutralize spilled hydrochloric acid with limestone, slaked lime or soda ash to minimize the possible generation of hydrogen gas. Special Fire Fighting Procedures: Wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in the pressure-demand or positive pressure mode. Special neutralization procedures, if applicable, include the application of chemically basic substances such as soda ash or slaked lime.

## SECTION 5 REACTIVITY DATA

Stability/Polymerization: Hydrochloric acid is stable in closed containers during routine operations at room temperature. Hazardous polymerization cannot occur. Chemical Incompatibilities: Hydrochloric acid reacts dangerously with acetic anhydride, 2-aminoethanol, ammonium hydroxide, aluminum phosphide, chlorosulfonic acid, thylene diamine, thyleneimine, oleum, perchloric acid, 3-propanolactone, propylene oxide, silver perchlorate and carbon tetrachloride, sodium hydroxide, sulfuric acid, uranium phosphide, vinyl acetate, sodium, and many amide compounds (Genium ref 84). This material is a strong mineral acid that is very reactive with bases. Conditions to Avoid: Exposure to incompatible chemicals and to any other material whose compatibility with hydrochloric acid or its vapor has not yet been established. The corrosive action of hydrochloric acid on most metals can liberate extremely flammable/explosive hydrogen gas ( $\text{H}_2$ ). Piping systems and containment systems must be chosen carefully. Hazardous Products of Decomposition: During fires hydrochloric acid may decompose by reacting with certain metals to produce very flammable and explosive hydrogen gas ( $\text{H}_2$ ). Significant amounts of hydrogen chloride gas ( $\text{HCl}$ ) are given off at room temperature; the rate of this generation increases as the temperature and the strength (1%) by weight of  $\text{HCl}$  in  $\text{H}_2\text{O}$  increase. Comments: Reactions between hydrochloric acid and cyanides, sulfides, and formaldehyde will produce extremely toxic hydrogen cyanide ( $\text{HCN}$ ), hydrogen sulfide ( $\text{H}_2\text{S}$ ), sulfur dioxide ( $\text{SO}_2$ ) and dichloromethylether respectively.

**SECTION 6 HEALTH HAZARD INFORMATION**

**Carcinogenicity** Hydrochloric acid is not listed as a carcinogen by the NTP, IARC, or OSHA.

**Summary of Risks:** See Genium Industrial MSDS 30 for details of the health effects of hydrogen chloride gas. Hydrochloric acid solutions will generate hydrogen chloride gas with all its health effects. These are irritating to the skin, eyes, and mucous membranes of the upper respiratory tract (URT). The severity of eye injury from splashes depends upon quantity, concentration/strength, and duration of the contact. Permanent visual damage has been reported. Ingestion of hydrochloric acid causes corrosion of the mucous membranes, esophagus, and stomach, as well as nausea, vomiting, intense thirst, and diarrhea. Erosion of exposed teeth may occur. Circulatory collapse and death are possible. Medical Conditions Aggravated by Long Term Exposure: None reported. Target Organs: Skin, eyes, URT. Primary Entry: Inhalation, skin contact. Acute Effects: Corrosive skin and eye burns, tissue damage and severe irritation of the URT. Chronic Effects: None reported. **FIRST AID:** Eyes: Immediately flush eyes, including under the eyelids, gently but thoroughly with plenty of running water for at least 15 minutes. Skin: Rinse the affected area with flooding amounts of water and then wash it with soap and water. Remove contaminated clothing under a safety shower. Inhalation: Remove the exposed person to fresh air, restore and/or support his or her breathing as needed. Have qualified medical personnel administer oxygen as required. Ingestion: Not likely. Should this type of exposure occur and the exposed person is responsive, give him or her 2 to 3 glasses of water, then milk of magnesia or limewater to drink. Do not induce vomiting. Spontaneous laryngeal spasms can occur. Never give anything by mouth to someone who is unconscious or convulsing. Get medical help (in plant, paramedic community) for all exposures. Seek prompt medical assistance for further treatment, observation and support after first aid. Note to physician: Treatment for respiratory effects following inhalation of hydrogen chloride gas includes using a 5% sodium bicarbonate solution as an aerosol, maintaining a proper fluid balance (diuretics may be useful) and decreasing the inflammatory response of the lungs by administering steroids on a short term basis (2 to 4 days). Severe inhalation exposure requires hospitalization and observation (72 hour minimum) for the delayed onset of pulmonary edema. Serial chest X rays and respiratory support, including intubation, may be required as an early intervention.

**SECTION 7 SPILL LEAK AND DISPOSAL PROCEDURES**

**Spill/Leak:** Notify safety personnel, evacuate unnecessary personnel, eliminate all sources of ignition immediately (hydrogen gas may be generated) and provide adequate ventilation. Cleanup personnel need a full set of protective clothing including a self-contained breathing apparatus (SCBA). Small spills and residue can be covered with an excess of a mixture of soda ash and slaked lime. After neutralization, do not flush waste directly to a sewer or into lakes, ponds, or streams. **Waste Disposal:** Contact your supplier or a licensed contractor for detailed recommendations. The allowable concentration of neutral salt in the effluent discharge is apt to be regulated. Study and follow Federal, state, and local regulations. Consider saving the waste hydrochloric acid for use as a neutralizing agent during cleanup operations of basic materials.

**OSHA Designations**

Listed as an Air Contaminant (29 CFR 1910.1000 Subpart Z)

**EPA Designations** (40 CFR 302.4)

**CERCLA Hazardous Substance, Reportable Quantity:** 5000 lbs (2270 kg) per the Clean Water Act (CWA) §311 (b) (4)

**SECTION 8 SPECIAL PROTECTION INFORMATION**

**Goggles:** Always wear protective eyeglasses or chemical safety goggles. Where splashing is possible, wear a full face shield. Follow OSHA eye and face protection regulations (29 CFR 1910.133). **Respirator:** Wear a NIOSH approved respirator per Genium reference §8 for the maximum use concentrations and/or the exposure limits cited in section 2. Follow OSHA respirator regulations (29 CFR 1910.134). For emergency or nonroutine operations (spills or cleaning reactor vessels and storage tanks) wear an SCBA. All respirators must be acid resistant. **Warning:** Air purifying respirators will not protect workers in oxygen-deficient atmospheres. Other: Wear impervious gloves, boots, aprons, gauntlets, etc. to prevent any contact with this material. All clothing must be acid resistant. **Ventilation:** Install and operate general and local maximum-explosion-proof ventilation systems powerful enough to maintain airborne levels of hydrogen chloride below the OSHA PEL cited in section 2. Local exhaust ventilation is preferred because it prevents dispersion of the contaminant into the general work area by eliminating it at its source. Consult the latest edition of Genium reference 103 for detailed recommendations. Make ventilation system ductwork and exposed fan components acid resistant. **Safety Stations:** Make emergency eyewash stations, safety/quick-drench showers, and washing facilities available in work areas. **Contaminated Equipment:** Contact lenses pose a special hazard: soft lenses may absorb irritants, and all lenses concentrate them. Do not wear contact lenses in any work area. Remove contaminated clothing and launder before wearing it again; clean this material from your shoes and equipment. Other: Design all engineering systems to be acid resistant and explosion proof (hydrogen gas may be accidentally generated). **Comments:** Practice good personal hygiene: always wash thoroughly after using this material and before eating, drinking, smoking, using the toilet, or applying cosmetics. Keep it off your clothing and equipment. Avoid transferring it from your hands to your mouth while eating, drinking, or smoking. Do not eat, drink, or smoke in any work area. Do not allow hydrochloric acid vapor.

**SECTION 9 SPECIAL PRECAUTIONS AND COMMENTS**

**Storage/Segregation:** Store hydrochloric acid in closed containers in a cool, dry, well ventilated area away from sources of ignition, strong oxidizers, strong bases, out of direct sunlight, and away from incompatible chemicals (see sect. 5). Protect containers from physical damage. **Special Handling/Storage:** Storage areas should have acid resistant floors and approved drainage facilities. Use nonsparking tools in areas around tanks and pipes where hydrogen gas may be generated. Engineering Controls: Make sure all engineering systems (production, transportation) are of maximum-explosion-proof design. Ground and bond all containers and pipelines, etc. used in shipping. Transferring, reacting, production and sampling operations to prevent static sparks. Hydrogen gas may become concentrated inside metal equipment: perform operations to search out possible hidden areas of hydrogen gas carefully. Other Precautions: Carefully follow our supplier's recommendations concerning the proper handling and storage procedures of hydrochloric acid. Provide emergency neutralization materials (soda ash, limestone, or slaked lime) and equipment near storage and use areas.

**Transportation Data:** 49 CFR 172.101.2)

**DOT Shipping Name:** Hydrochloric Acid

**DOT Hazard Class:** Corrosive Material

**ID No:** UN1789

**DOT Label:** Corrosive

**DOT Packaging Requirements, DOT Packaging Exceptions:** 49 CFR 173.263

**IMO Shipping Name:** Hydrochloric Acid, Solution

**IMO Hazard Class:** 8

**IMO Label:** Corrosive

**IMDG Packaging Group:** II

**References:** 1 76 38 34-94 100 116 117 120 122

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Prepared by PJ Iggoe BS

Industrial Hygiene Review: DJ Wilson CH

Medical Review: W Silverman, MD

perox-gara.  
Hydrogen Peroxide

Material Safety Data Sheet

Section I		Name															
Product	Hydrogen Peroxide 50%	Emergency Assistance															
Chemical/Synonyms	H <sub>2</sub> O <sub>2</sub> /Peroxide	Chemtrec 1 800-424 9300	<table border="1"> <tr> <td>Health</td> <td>2</td> </tr> <tr> <td>Fire</td> <td>0</td> </tr> <tr> <td>Reactivity</td> <td>2</td> </tr> </table>	Health	2	Fire	0	Reactivity	2								
Health	2																
Fire	0																
Reactivity	2																
Chemical Family	Inorganic Peroxide	P.S.I. (602)-327-0277															
C.A.S. Number	7722 84-1	UN Number	2014														
		<table border="1"> <tr> <td colspan="2">Hazard Rating</td> </tr> <tr> <td>Least</td> <td>Slight</td> </tr> <tr> <td>0</td> <td>1</td> </tr> <tr> <td>Moderate</td> <td>High</td> </tr> <tr> <td>2</td> <td>3</td> </tr> <tr> <td></td> <td>Extreme</td> </tr> <tr> <td></td> <td>4</td> </tr> </table>		Hazard Rating		Least	Slight	0	1	Moderate	High	2	3		Extreme		4
Hazard Rating																	
Least	Slight																
0	1																
Moderate	High																
2	3																
	Extreme																
	4																

Section II		Ingredients	
Composition		%	Toxicity Data
Hydrogen Peroxide	50	90% H <sub>2</sub> O <sub>2</sub>	Oral LD <sub>50</sub> 2gm/kg (mouse)
Water	50		
Stabilizers	Trace		

Section III		Physical Data	
Boiling Point (°F)	237 @ 760 MM Hg	Melting Point (°F)	61
Specific Gravity (H <sub>2</sub> O = 1)	1.195 @ 68°F	% Volatile By Volume	100
Solubility in Water	Complete	Evaporation Rate (Butyl Acetate = 1)	Less than 1
Vapor Pressure (mmHg)		18 @ 85°C	
Vapor Density (Air = 1)		NA	
Appearance And Odor			
Clear colorless liquid Concentrations over 35% may have sharp odor			

Section IV		Reactivity	
Stability	<input type="checkbox"/> Unstable <input checked="" type="checkbox"/> Stable	Hazardous Polymerization	<input type="checkbox"/> May Occur <input checked="" type="checkbox"/> Will Not Occur
<p>Conditions And Materials To Avoid</p> <p>Contamination by many substances including heavy metals and their salts reducing agents strong oxidizers alkalies and particulate solids will cause decomposition. The rate of decomposition increases with increasing temperature and may be very vigorous with rapid generation of large volumes of oxygen and steam. Consult Peroxidation Systems Inc on handling and materials or construction.</p>			
<p>Hazardous Decomposition Products</p> <p>Oxygen steam peroxide vapor and heat</p>			



# Hydrogen Peroxide

## Material Safety Data Sheet

Section V		Fire And Explosion Hazards	
Flash Point And Method Used NA	Flammable Limits (% Volume in Air) non-flammable	Lower	Upper
Extinguishing Media  Water			
Special Fire Fighting Procedures And Precautions  Wear protective clothing and self contained breathing apparatus			
Unusual Fire And Explosion Hazards  <p><u>Strong oxidizer</u> Hydrogen peroxide is not flammable but can initiate spontaneous combustion of paper, wood, cloth, and other organic materials. Ignition may be rapid but can be delayed for several hours. Rapid oxygen evolution from decomposing hydrogen peroxide may increase the intensity of a fire.</p> <p>Oxygen enrichment of poorly ventilated organic atmospheres increases the potential for vapor phase explosions.</p>			

Section VI		Emergency And First Aid Procedures	
<p><u>Skin/eyes</u> Flush with large amounts of water for at least 15 minutes. Quickly remove contaminated clothing and shoes. Flush clothing with large amounts of water. Contact a physician in case of eye contact with peroxide.</p> <p><u>Ingestion</u> Drink large amounts of water to dilute. Sit upright. Contact physician.</p> <p><u>Note to Physician</u></p> <p>It may be advisable to insert a gastric tube to relieve or prevent increased pressure that may result from the rapid evolution of oxygen upon decomposition.</p> <p><u>Inhalation</u> Remove victim to fresh air. Contact a physician.</p>			

Hydrogen Peroxide

Material Safety Data Sheet

Section VII

Employee Protection

Respiratory Protection

Self contained breathing apparatus should be available

Protective Clothing

Adequate eye protection rubber gloves and boots, PVC slicker suit

Additional Protective Measures

Water source and safety shower/eye wash should be located close to where hydrogen peroxide is handled

Section VIII

Health Information

Exposure to skin or eyes may cause chemical burns Inhalation of vapor or mist may cause irritation or chemical burns to mucous membranes and respiratory system

Ingestion may cause chemical burns as well as injury by distention of the esophagus or stomach due to the sudden evolution of gasses

Section IX

Occupational Exposure Limits

ACGIH - TLV - TWA 1 ppm

OSHA 8 hour time weight average (TWA) = 1 ppm

Section X

Environmental Protection

Spill Or Leak Procedures

Flush spill area with large amounts of water Do not return spilled material to original container Comply with Federal State and local regulations on reporting spills

Waste Disposal

Dilute with large amounts of water then flush to sewer Comply with Federal State and local regulations

Environmental Hazards

None

perox-guard  
Hydrogen Peroxide

Material Safety Data Sheet

Section XI

Special Precautions

- 1) Avoid heating hydrogen peroxide and store away from combustibles
- 2) Do not contaminate hydrogen peroxide
- ) Storage containers/vessels for hydrogen peroxide must be vented and made of compatible plastics, 304 or 316 stainless steel or high purity aluminum. Contact Peroxidation Systems Inc for additional information regarding other compatible materials

Section XII

Transportation Requirements

Department Of  
Transportation  
Classification

- ☐ Flammable  
Liquid
- ☐ Flammable  
Solid
- ☐ Flammable  
Gas

- ☐ Combustible  
Liquid
- ☐ Poison  
Class A
- ☐ Poison  
Class B

- ☒ Oxidizing  
Material
- ☐ Corrosive  
Material
- ☐ Irritating  
Material

- ☐ Non Flammable  
Gas
- ☐ Not Hazardous By  
DOT Regulations
- ☐ Other  
Specify Below

DOT Proper Shipping Name

Hydrogen peroxide solution 50% peroxide

Other Regulations

Hydrogen peroxide in concentrations below 52% is not regulated as a hazardous material when shipped in tank trucks or tank cars

Section XIII

Other Regulatory Controls

Contains stabilizers and promoters compatible for use with the perox-guard<sup>TM</sup> UV/Hydrogen Peroxide chemical oxidation process and perox-guard<sup>TM</sup> sulfide control services

TA - Food grade hydrogen peroxide must meet Food Chemical Code specifications

Peroxidation Systems Inc  
4400 E Broadway Suite 602  
Tucson Arizona 85711

Phone 1-(602) 327-0277

To the best of our knowledge the information contained in this Material Safety Data Sheet is accurate. However, Peroxidation Systems Inc makes no warranty expressed or implied or accepts any liability in connection with this information or its use.

Date Prepared

MAY 1989

# MATERIAL SAFETY DATA SHEET

GENIUM PUBLISHING CORPORATION

145 CATALYN ST SCHENECTADY NY 12303 USA (518) 377-8854



MSDS # 3A  
SODIUM HYDROXIDE  
50% LIQUID

Revision A  
Issued October 1977  
Revised August 1985

Genium's MSDS Collection to be used as a reference

## SECTION 1 MATERIAL IDENTIFICATION

1-

MATERIAL NAME SODIUM HYDROXIDE 50% LIQUID

OTHER DESIGNATIONS Liquid caustic soda lye solution CAS #1310-73-2 (NaOH)

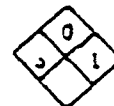
MANUFACTURER Available from many sources including

Diamond Shamrock Co Chlor Alkali Div

331 Phelps Court Box 152000

Irving TX 75015 2300

(800) 241 3134



## SECTION 2 INGREDIENTS AND HAZARDS

%

HAZARD DATA

SODIUM HYDROXIDE (NaOH)

>48.5

Ceiling Limit 2 mg/m<sup>3</sup>

### TYPICAL IMPURITIES

Carbonate (as Na<sub>2</sub>CO<sub>3</sub>)

<0.25

1% NaOH Soln

Chloride (as NaCl)

<1.15

Chlorate (as NaClO<sub>3</sub>)

<0.25

Eye rabbit Severe  
Irritation

Sulfate (as Na<sub>2</sub>SO<sub>4</sub>)

<0.03

Silica (as SiO<sub>2</sub>)

<0.01

Water

balance

Current (1985-86) ACGIH TLV Current OSHA PEL is 2.0 mg/m<sup>3</sup> averaged over 8 hours

## SECTION 3 PHYSICAL DATA

Melting point 1 atm ca 140°C

Specific gravity 60/60°F 1.53

Boiling point (water) 50%

Density 155/gal 12.76

Water Solubility complete

Viscosity @ 20°C cps 50

APPEARANCE & ODOR Clear liquid - No odor

DESCRIPTION A 50% solution of sodium hydroxide (NaOH) in water

## SECTION 4 FIRE AND EXPLOSION DATA

Lower

Upper

Flash Point and Method

Autoignition Temp

Flammability Limits in Air

None not combustible

N/A

N/A

N/A

N/A

### EXTINGUISHING MEDIA

Use extinguishing agents suitable for the surrounding fire. Use water spray to cool containers or this material which are involved in a fire situation to help prevent rupture.

Sodium hydroxide will react with metals such as aluminum, tin, and zinc to generate flammable and explosive hydrogen gas.

Fire fighters should wear self-contained breathing apparatus and full protective gear to prevent contact with this corrosive material.

## SECTION 5 REACTIVITY DATA

This material is stable under normal storage conditions in sealed containers. Polymerization will not occur. There are no hazardous decomposition products. It reacts with CO<sub>2</sub> to form sodium carbonate. It reacts violently with acids accompanied by heat generation and with many organic chemicals, especially nitroaromatics and halocarbons. It can react with chloroethylene to form spontaneously ignitable ethoxide/ene.

It can react with leather and wool. Contact with aluminum, zinc, magnesium, and alloys has on a few occasions caused the formation of hydrogen gas (SOS #63) (flammable).

## SECTION 6 HEALTH HAZARD INFORMATION

TLV Ceiling Unit 7 mg/m<sup>3</sup>

Sodium Hydroxide is a strong alkali and is dangerous when improperly handled. It is destructive to all human tissue it contacts producing severe burns. Eye contact causes severe permanent injury. Skin contact causes severe burns and if not removed immediately severe burns with scarring. The effects of inhalation of the mist varies from mild irritation to destructive burns. Pneumonitis may occur. Ingestion causes severe burns of mouth, throat and stomach and may be fatal.

**FIRST AID** Wash eyes immediately with plenty of running water for at least 15 minutes including under eyelids and all surfaces. Speed in rinsing eyes with water is important if permanent injury is to be avoided. Get medical help immediately. **SKIN CONTACT** Flush exposed area promptly with large quantities of water. Remove contaminated clothes while washing. Prolong washing in serious cases until medical help arrives. Get medical attention or serious exposure. **INGESTION** Immediately give person large quantities of water or milk to drink (Never give anything by mouth to an unconscious person). Do not induce vomiting. Obtain medical assistance immediately. **INHALATION** Remove from exposure to mist and get prompt medical help (Paramedic or hospital community).

## SECTION 7 SPILL LEAK AND DISPOSAL PROCEDURES

Planning ahead is essential for handling spills. Clean up personnel should wear protective equipment to prevent skin and eye contact. Pick up spill with vacuum equipment (alkali resistant) for disposal or flush to holding area with water. Neutralize residue with dilute acid and rinse with water.

**DISPOSAL** Waste caustic must never be discharged directly to sewers, drains or surface waters. Dilute well with water and carefully neutralize with acid. Follow all applicable federal, state and local regulations.

EPA HAZARDOUS WASTE NUMBER D002 corrosive (solution pH >12.5) 40CFR 261.22  
REPORTABLE SPILL QUANTITY 1000 lbs (40CFR117)

## SECTION 8 SPECIAL PROTECTION INFORMATION

Provide adequate general ventilation and exhaust ventilation to meet TLV requirement especially where the possibility of mist formation exists. Use a NIOSH approved respirator with full face covering for mist where needed. Use chemical safety goggles. A plastic faceshield in addition to safety goggles should be worn if splashing is probable. Use rubber gloves, apron or protective clothing and rubber boots where needed to prevent contact with sodium hydroxide solution.

Eyewash stations and safety showers must be immediately available.

**THIS MATERIAL POSES A SPECIAL HAZARD TO CONTACT LENSES WEARERS** the slippery nature of this solution would make it extremely difficult to remove the contact lenses. Critical rinsing of the contaminated eye could be delayed.

## SECTION 9 SPECIAL PRECAUTIONS AND COMMENTS

Store in well sealed containers. Protect containers from physical damage. Avoid handling conditions which can lead to spills or mist formation. Have abundant water (preferably running water) available where material is stored, unloaded and handled or emergency use. Drains serving areas where material is stored or used should have retention basins for pH adjustment and dilution of spills and flushings be considered. Workers handling this material should be trained in proper handling precautions and emergency procedures. Proper protective equipment nearby.

DOT HAZARD CLASSIFICATION Corrosive Material

DOT LABEL Corrosive

DOT ID NUMBER UN1824

DATA SOURCE(S) CODE (See Glossary) 7 4 9 11 12 27 35 58 V

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APPROVALS

PRO Approved 11/85

INDUST. HYGIENE/SAFE

EW 11/85

MEDICAL REVIEW

ED 11/85

# Material Safety Data Sheet

From Genium's Reference Collection  
Genium Publishing Corporation  
1145 Catalyn Street  
Schenectady NY 12303 1836 USA  
(518) 377 8855



No 61  
NITROGEN  
(Revision A)

Issued April 1980  
Revised April 1986

## SECTION 1 MATERIAL IDENTIFICATION

21

### MATERIAL NAME NITROGEN

**DESCRIPTION** Gas supplied in cylinders (2000+ psig) or cold liquid supplied in vented Dewar containers.

**OTHER DESIGNATIONS** N<sub>2</sub>, CAS #7727 37 9 ASTM #D1933

**MANUFACTURER/SUPPLIER** Available from several suppliers, including.

Air Products & Chemicals, Inc., Industrial Gas Division, PO Box 538

Allentown, PA 18105 Telephone: (215) 481-4911

Airco Industrial Gases of the Boc Group Inc., 575 Mountain Avenue,

Murray Hill, NJ 07974 Telephone: (201) 464-81000

Union Carbide Corp., Linde Div., 39 Old Ridgebury Rd., Danbury CT 06817 Telephone: (203) 794-5300

### HMIS

H 2

F 0

R 0

PPE\*

\*See Sect 8



(Liquified)

R 1

I 1

S 2 (Liquid)

K 0

## SECTION 2. INGREDIENTS AND HAZARDS

%

### HAZARD DATA

Nitrogen, CAS #7727 37 9

Oxygen, CAS # 7782-44-7

>99.5

< 0.5

No TLV Established.

## SECTION 3 PHYSICAL DATA

Boiling Point, 760 mm Hg ... 320.4 F (155.3 C)

Vapor Density (Air = 1) ... 0.967

Solubility in Water @ 20 C, Vols./100 vols. ... 1.6

Density (liq) g/cm<sup>3</sup> ... 0.8

Melting Point ... 345.7 F (209.86 C)

Critical Temperature ... 232.3 F (147.1 C)

Critical Pressure, Atm ... 33.5

Molecular Weight ... 28.01

Expansion Ratio, Liquid to Gas @ 70 F 1.696

Appearance and odor A colorless, odorless tasteless gas or a cryogenic liquid.

## SECTION 4 FIRE AND EXPLOSION DATA

LOWER UPPER

Flash Point and Method

Autoignition Temp

Flammability Limits in Air

Not Found

Not Found

Nonflammable

Not Found

Not Found

Use extinguishing media that are appropriate to the surrounding fire. Do not discharge solid streams of water into liquid N<sub>2</sub>. Use water spray to cool fire-exposed containers or if desirable, to increase the rate of evaporation of the liquid if the increased rate can be controlled (cryogenic liquid will rapidly freeze water). Nitrogen is a nonflammable material that will not support combustion. It presents no unusual explosion hazard unless the compressed gas is exposed to fire. When containers may rupture violently. Nitrogen cylinders are equipped with pressure relief devices that are designed to vent N<sub>2</sub> when they are exposed to elevated temperatures and pressures. When liquid nitrogen is spilled it can release a rapidly vaporizing cloud that will create an oxygen-deficient atmosphere.

## SECTION 5 REACTIVITY DATA

Nitrogen is stable when stored in closed containers. It does not polymerize. Nitrogen is noncorrosive and is nearly inert at room temperature. At high temperatures it can combine with oxygen to form oxides, and with hydrogen to form ammonia. When heated with carbon in the presence of alkalis or barium oxide it may form cyanides. It can form nitrides with lithium, silicon, calcium, strontium, and barium when it is at a red heat.

It has been reported that nitrogen can be oxidized explosively by ozone.

Lithium and titanium at an elevated temperature can burn in a nitrogen atmosphere. Beryllium can be ignited in a mixed nitrogen and-carbon dioxide atmosphere.

Nitrogen will react with oxygen in the presence of sparking (from an electric arc or a gas fired furnace) to produce nitric oxide gas.

**SECTION 6 HEALTH HAZARD INFORMATION**

Nitrogen is not listed as a carcinogen by the NTP, IARC, or OSHA.

This material is nontoxic and is classified as a simple asphyxiant by virtue of its displacement of oxygen. Symptoms of exposure depend on the degree and the duration of oxygen deficiency. They can include increased frequency and volume of breathing, increased pulse rate, muscular incoordination, fatigue, nausea, vomiting, and collapse. Inhalation of pure nitrogen atmosphere produces immediate loss of consciousness; death follows unless air/oxygen breathing can be quickly restored.

Contact with liquid nitrogen or cold vapors can cause cryogenic burns (severe frostbite/freeze burns).

**FIRST AID CONTACT WITH LIQUID NITROGEN.** Promptly flush areas affected with lots of tepid water to reduce freezing of tissue. (Do not apply direct heat to affected areas.) Do not rub frozen areas. Loosely apply dry sterile, bulky dressings to protect area from infection and from further injury. Get medical help.

**INHALATION** Caution! Would be rescuers need to be concerned with their own safety in oxygen-deficient areas. Use self-contained breathing equipment. Remove victims to fresh air. Quickly restore and/or support his breathing as required, administering oxygen if available. Get medical help.

**INGESTION** Get medical help. **ACUTE EFFECTS** Gas: Simple asphyxiation by displacement of oxygen. Liquid: Cryogenic burns. **PRIMARY ENTRY** Inhalation.

**GET MEDICAL ASSISTANCE** = In plant, paramedic, community. Get medical help for further treatment, observation and support after first aid.

**SECTION 7 SPILL, LEAK AND DISPOSAL PROCEDURES**

Notify safety personnel of major nitrogen leaks or spills. Shut off leak if you can do so without risk. Evacuate all personnel from the danger area until ventilation can restore a safe oxygen level. Emergency personnel need self-contained breathing equipment. Minor leaks (which are dangerous in enclosed areas) can be detected by painting the suspected area of leakage with a soap solution. Prevent liquid nitrogen from contacting vulnerable steel structures and vehicle tires (see sect. 9). Allow spilled liquid to evaporate.

**DISPOSAL.** Remove a liquid nitrogen container or leaking cylinder outdoors or place into a hood with good forced ventilation. Allow gas to discharge at a moderate rate. Defective cylinders should be tagged to indicate defect. Close the valve and return the defective cylinder to supplier.

**SECTION 8. SPECIAL PROTECTION INFORMATION**

Provide adequate general and local exhaust ventilation to prevent workplace atmospheres from becoming oxygen deficient (minimum O<sub>2</sub> volume = 18%). Provide air-supplied or self-contained breathing equipment for emergency or nonroutine situations where the nitrogen level is excessive. Use a safety line and a standby worker when respirator protected personnel enter a hazariously nitrogen-enriched area. (The standby worker should have a self-contained breathing apparatus immediately available.) Those working with liquid nitrogen should wear approved insulating gloves, safety glasses, and other protective clothing as required by use conditions to prevent any skin contact with liquid nitrogen. Cuffless trousers should be worn outside high topped shoes. Safety shoes are recommended for those handling cylinders of gases.

Wear safety gloves and approved insulated gloves. Use air supplied or self-contained breathing apparatus.

Contact lenses pose a special hazard: soft lenses may absorb irritants, and all lenses concentrate them.

**SECTION 9 SPECIAL PRECAUTIONS AND COMMENTS**

**STORAGE SEGREGATION** Store in a cool, dry, well ventilated, low fire-risk area. Protect containers against physical damage.

**SPECIAL HANDLING/STORAGE.** Protect containers from extremes of temperature and weather. (Do not allow any part of a compressed gas cylinder to be exposed to temperatures above 125°F [51.6°C]). Follow general safety procedures for handling and securing compressed gas cylinders. Liquid nitrogen storage areas should be kept clean and free from flammable materials. Make sure that liquid nitrogen containers are properly vented to prevent buildup of pressure. All pressure equipment and process lines should be designed so that the minimum burst pressure is at least four (4) times the expected maximum pressure. Certain materials are unsuitable for service in contact with liquid nitrogen because they become extremely brittle and can be readily shattered by impact.

DOT Classification: Nonflammable Gas

UN1066 (Compressed) UN1977 (Cryogenic Liquid)

LABEL: Nonflammable Gas

Data Source(s) Code: 1 4-11 14 17 25 51 63 82 84 CK

Warranties as to the suitability of information herein for purchaser's purposes are necessarily purchaser's responsibility. Therefore, although reasonable care has been taken in the preparation of such information, Cesium Publishing Corp. extends no warranties, makes no representations and assumes no responsibility as to the accuracy or suitability of such information for application to purchaser's intended purposes or consequences of its use.

Approvals: J.D. Amos 1/87

Indust. Hygiene/Safety

Medical Review

12-86

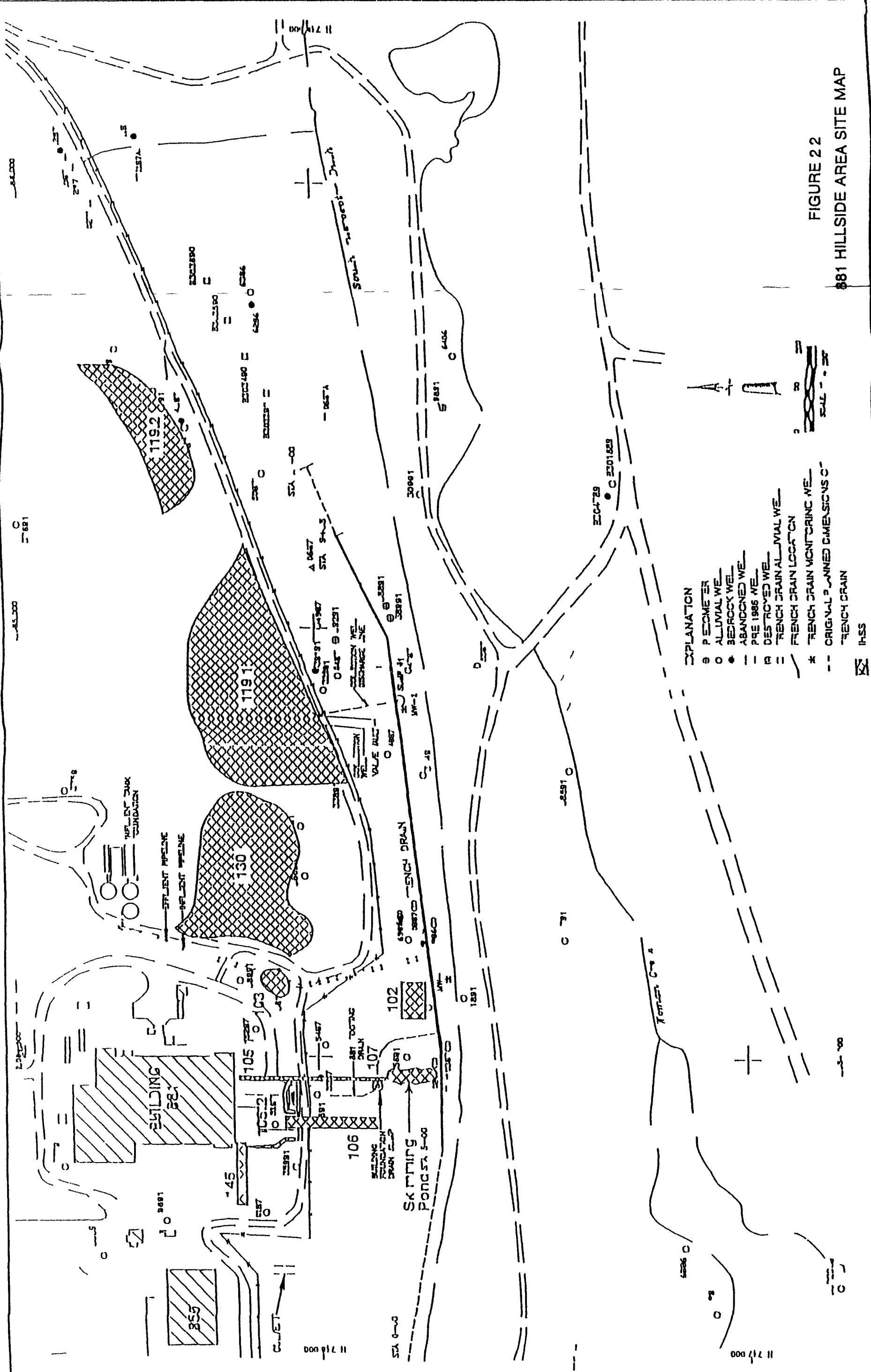


FIGURE 22  
881 HILLSIDE AREA SITE MAP



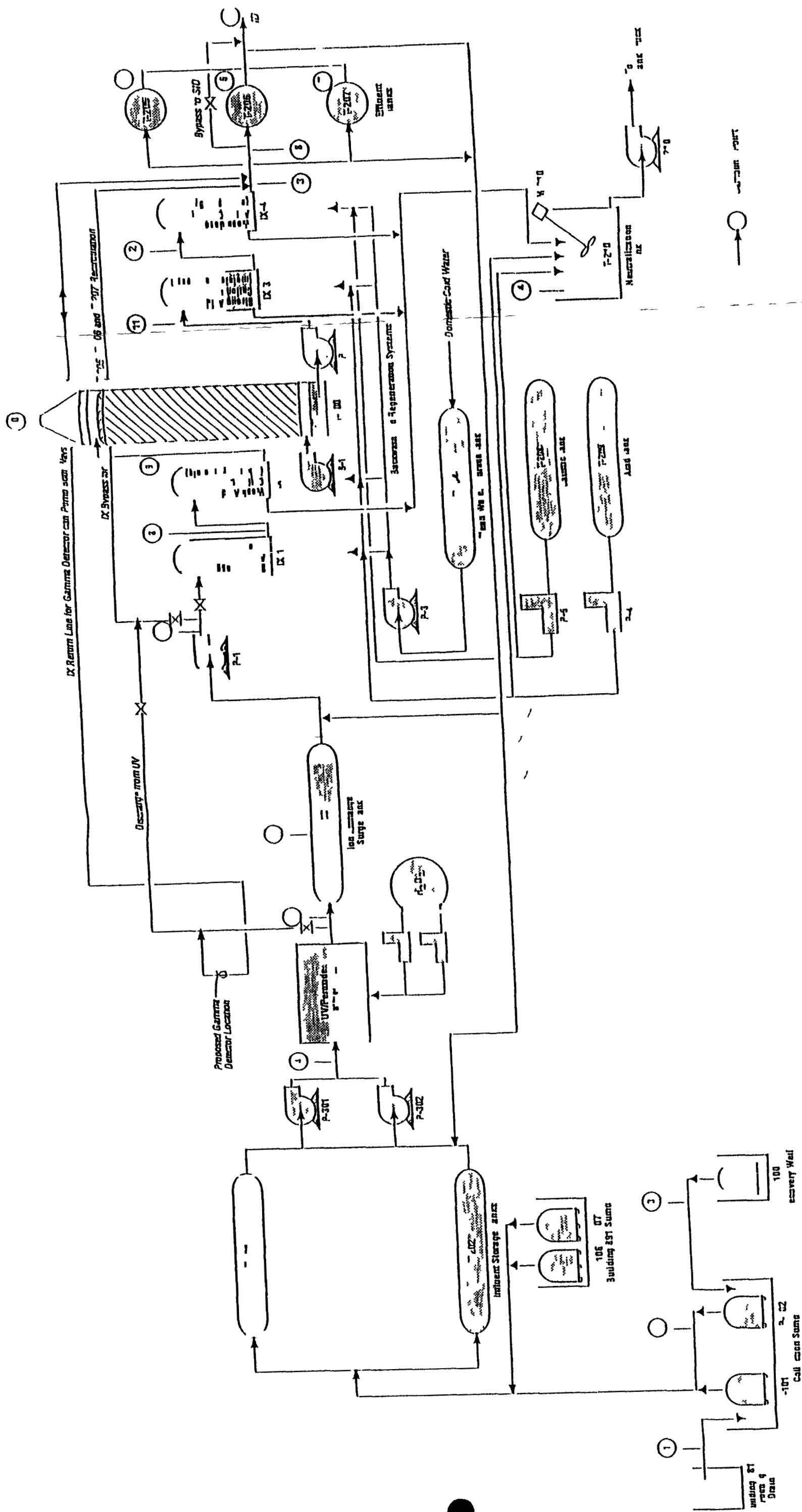


FIGURE 3.1  
PROCESS FLOW DIAGRAM